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KOBEL (F.). **Jahresbericht 1946-1948 der Eidg. Versuchsanstalt für Obst-, Wein- und Gartenbau in Wädenswil.** [Annual report for 1946 to 1948 of the Federal Experiment Station for Fruit-Growing, Viticulture, and Horticulture at Wädenswil.]—*Annu. agric. Suisse*, 51, 1, pp. 69–122, 2 figs., 1 diag., 1950.

The following are some of the items, excluding those already noticed from other sources, of phytopathological interest in this report [cf. *R.A.M.*, 25, p. 99], to which S. BLUMER, C. ZÄCH, and H. FISCHER contributed. During the hot summers of 1946 and 1947, beans [*Phaseolus vulgaris*] suffered from a disease formerly attributed to bacterial infection but now believed on symptomatological grounds to be caused by the black root virus [ibid., 22, p. 126].

J. Gondak's studies on the action of oxyquinoline on *Botrytis cinerea* [ibid., 26, p. 527; 29, p. 420] showed that the susceptibility of the pathogen to the chemical varies greatly at different stages of development. Moreover, older mycelia and in particular sclerotia cannot be destroyed even by relatively heavy doses, whereas they do succumb to formaldehyde [ibid., 22, p. 195]. Soil treatments with oxyquinoline cannot be recommended, therefore, as a practical means of eliminating the sclerotia.

Further depredations by 'rotbrenner' [*Pseudopeziza tracheiphila*] in the vineyards of eastern Switzerland in 1946 led to thorough investigations in four localities in 1947 into the possibilities of control. During April and May periodical examination of the number and stage of maturity of the apothecia on old foliage indicated the likelihood of an early epiphytotic following heavy precipitation in these critical months. Since the rainfall during the experimental period was below the average the disease generally assumed a mild form and no definite conclusions could be reached.

Inoculation with *Monilia* [*Sclerotinia*] *fructigena* increased the production of carbon dioxide in the tissue of Glocken apples held at 20° C. up to sixfold [cf. ibid., 9, p. 546]. During the first five to seven days of the 20-day experiment the pathogen augmented the respiration of the host tissue, contributing only a little itself; after this period, i.e., when the tissue is permeated by the fungus, the ratio appears gradually to shift in favour of the latter.

Of six treatments tested in a three-spray schedule for the control of *Didymella* [*applanata*] on raspberry [ibid., 21, p. 280] the most effective were copper-Sandoz plus thiovit and Bordeaux mixture with a wetter, which reduced the incidence of infection to about a third of the 80 to 90 per cent. in the control rows.

Report of the Science Service, Canada Department of Agriculture, for the year ended March 31, 1950.—120 pp., 1951.

In the Botany and Plant Pathology section of this report on plant disease work in Canada [cf. *R.A.M.*, 30, p. 17] much of the information in the part dealing with

mycology and miscellaneous projects (pp. 42–70) has already been noticed from other sources [ibid., 30, p. 404]. Certain isolates of the root rot organism of wheat, *Helminthosporium sativum* [ibid., 30, p. 507 and next abstract], appropriately paired on a suitable medium, produced mature perithecia of the perfect state, referred to *Cochliobolus sativus* [ibid., 29, p. 254]; pathogenicity tests with Marquis and Regent wheat showed that all the ascospore isolates, except one, were virulent. In greenhouse tests arasan mixed with the soil at a concentration approaching 0·01 per cent. by weight gave a high degree of protection against root rot.

Field tests at Winnipeg of 25 varieties of spring wheat, 17 of durum wheat, and 29 of oats showed that several new hybrids and selections of each crop possessed considerable resistance to common root rot caused by species of *Helminthosporium* and *Fusarium* [ibid., 30, p. 307]. Among spring wheats McMurachy's Selection again proved to be the most resistant. Other varieties displaying considerable resistance were Garnet, Thatcher Selection (C.T. 920), Thatcher × Regent (C.T. 173), and Hope × Timstein (C.T. 509). Among the durum wheats, Mindum and Ld. 303 (D.T. 204) were the most resistant. Of the oats, R.L. 1574 × Roxton (O.T. 128), Garry Selection (O.T. 137), and Victory showed high resistance. Several Garry selections were markedly resistant to *H. victoriae* [cf. ibid., 30, pp. 225, 408, 562, and next abstract]. The discovery of lucerne bacterial wilt [*Corynebacterium insidiosum*: ibid., 29, pp. 213, 349] in eastern Ontario suggests that the disease will eventually be found throughout Canada. In a survey of 72 sweet clover [*Melilotus* spp.] fields, in Essex and Kent counties, root rot (*Phytophthora cactorum*) [ibid., 20, p. 102; 30, p. 164] was found in 57. Of 15 varieties of sweet clover tested all proved relatively susceptible [cf. ibid., 22, p. 27], including D-236, selected in Wisconsin for its resistance. The Teton potato variety again proved highly resistant to bacterial ring rot (*C. sepedonicum*) [ibid., 27, p. 537; 28, p. 416; 29, p. 372, and next abstract].

An effective technique was devised for testing the resistance of apple trees to scab (*Venturia inaequalis*) [loc. cit.]. The fungus was multiplied on 1 per cent. malt extract in 250-ml. Erlenmeyer flasks and suspensions of spores from the flasks were atomized on to seedlings derived from crosses and open-pollinated flowers of both susceptible and resistant parents. In co-operation with the Division of Chemistry at Summerland, apple trees with little leaf and rosette [zinc deficiency: cf. ibid., 27, p. 424; 28, p. 526] were sprayed during dormancy with zinc sulphate (20 lb. per 100 gals.), and marked recovery occurred.

Inoculations of Montmorency sour cherry and Italian prune with two strains of the prune [plum] dwarf virus [ibid., 30, p. 616] and two of the necrotic ring spot virus [loc. cit.] were made, singly and in combination. With one strain (PDE) of plum dwarf in combination with either of two strains of necrotic ring spot, symptoms typical of cherry yellows virus [loc. cit.] resulted. The plum dwarf virus alone produced typical plum dwarf symptoms on Italian prune. With the other strain (PDY) of plum dwarf in combination with the same two strains of necrotic ring spot negative results were obtained, but in this case plum dwarf itself gave no reaction on Italian prune.

Oats free from symptoms of manganese deficiency [ibid., 29, p. 496] were grown in manganese-deficient soil treated with cyanogas (500 lb. per acre), calcium nitrate (175 lb.), or ammonium sulphate (142 lb.). The numbers of manganese-oxidizing, cellulose-decomposing, and denitrifying organisms in the rhizospheres of oats growing in the treated soils were much lower than in the control plots. Statistical analysis of the data showed significant positive correlation between the severity of the disease and numbers of these organisms.

An investigation of the effect of decay on the management and utilization of stands of balsam fir [*Abies balsamea*] in New Brunswick was begun in 1949. Red heart rot (*Stereum sanguinolentum*) [cf. ibid., 24, p. 298] and butt rot caused by

Corticium galactinum [cf. ibid., 19, p. 354 and next abstract], previously considered unimportant as a decay organism in balsam fir, together accounted for about 80 per cent. of the decay in this species. *Polyporus* [*Polystictus*] *abietinus* [ibid., 25, p. 525], causing white rot, was the most important deteriorating agent in balsam fir killed by the spruce budworm [*Harmologa fumiferana*], causing over 95 per cent. of the loss. A study of 933 balsam trees in three regions of Ontario showed that *S. sanguinolentum* and *Fomes pinicola* [cf. ibid., 30, p. 205] were responsible for almost all the trunk rot. Substantial decay in black cottonwood [*Populus trichocarpa*] was caused by *Pholiota destruens* [cf. ibid., 13, p. 605], *Polyporus delectans*, *P. adustus* [cf. ibid., 28, pp. 596, 607], and *F. applanatus* [*Ganoderma applanatum*: cf. ibid., 27, p. 547]. In New Brunswick white pine blister rust [*Cronartium ribicola*: cf. ibid., 29, p. 570; 30, p. 4] appears to prevail throughout the range of *Pinus strobus* with 12 to 45 per cent. of the trees infected in individual stands. In Nova Scotia the percentage of diseased trees varied from 0 to 35 per cent. *Corticium galactinum* may be an important cause of mortality among young trees of several coniferous species. During 1949 the analysis was completed of the field data previously collected on decay of maple [*Acer* spp.] Species responsible for 88 per cent. of the known infections and over 90 per cent. of the cubic volume of rot of living hard maple were *Armillaria mellea*, *C. vellereum*, *F. connatus* [ibid., 26, p. 429], *F. igniarius* [loc. cit.], *Hydnum septentrionale* [cf. ibid., 27, p. 502], *Pholiota adiposa* [cf. ibid., 26, p. 429], *P. spectabilis*, *Polyporus glomeratus* [loc. cit.], and *Ustulina vulgaris* [*U. deusta*: loc. cit.; see also ibid., 28, p. 311].

In 1,393 samples from 88 dead and dying yellow birch (*Betula lutea*) in Ontario, the commonest fungus present was *Phomopsis* sp. [see next abstract], isolated from 83 trees. It was obtained consistently from definite cankers or disease areas on twigs, branches, branchlets, foliage, and buds.

Studies on the sexuality of *Fusarium sambucinum* f. 6 [ibid., 29, p. 275] showed that two mycelia of opposite mating type are required to produce fertile perithecia. Single ascospore or single conidial cultures are bisexual but self-sterile. Crosses between monospore cultures of opposite mating types of *F. sambucinum* f. 6 and *Gibberella cyanogena* [ibid., 16, p. 29] yielded fertile perithecia morphologically identical with the perithecia formed when appropriate strains of *F. sambucinum* f. 6 are mated. *G. cyanogena* is, therefore, considered to be the perfect state of *F. sambucinum* f. 6.

Effective field sprays were compounded by adsorbing malachite green on norit (carbon black) and on bentonite clay; preliminary results showed that a spray consisting of 0·5 lb. of each per 100 gals. satisfactorily controlled apple powdery mildew [*Podosphaera leucotricha*: ibid., 28, p. 443]. The norit reduced the concentration of soluble malachite green from 0·05 to 0·01 per cent. and so left an insoluble residue on the foliage; this prolonged its effectiveness.

A study at Ottawa of the nutritional requirements of *Elsinoe veneta* [see below, p. 67] showed that the fungus can be isolated from lesions on raspberry canes, grown on a raspberry leaf extract agar, and induced to produce conidia in sufficient quantities to make suspensions for inoculating large numbers of raspberry seedlings. Under suitable conditions (15° C., 95 per cent. relative humidity) macroscopic symptoms develop in two to three weeks. No lesions developed in 1949 on Viking and Newburg when late autumn spread occurred on other varieties.

At the Saanichton laboratory, British Columbia, a number of insoluble metallo-organic complexes (chelates) were prepared, and the most fungistatic tested as seed protectants. The mercury complexes of cupferron (ammonium nitrosophenylhydroxylamine) and of phenylthiohydantoic acid gave better control of damping-off (*Pythium ultimum*) [cf. ibid., 13, p. 799] of radish seedlings than did arasan or the copper complex of phenylthiohydantoic acid.

Report of the Minister of Agriculture for Canada for the year ended March 31, 1951. —102 pp., 1951.

In the section of this report [cf. *R.A.M.*, 30, p. 404] dealing with plant diseases (pp. 18–34) it is stated that nearly 80 per cent. of the merchantable volume of birch in New Brunswick has died as a result of die-back [ibid., 30, p. 350], but most of the remaining trees have recovered. The disease has caused severe injury on Cape Breton Island. A high percentage of 1,648 samples from 68 trees gave *Phomopsis* sp. [ibid., 30, p. 18 and preceding abstract]. Other fungi occurred frequently, but not consistently.

The importance of *Corticium galactinum* [cf. ibid., 30, p. 467 and preceding abstract] as an organism responsible for extensive butt and root rot of white pine [*Pinus strobus*] in Ontario was clearly demonstrated.

Sevier wheat, resistant in the seedling stage to *Helminthosporium sativum* [cf. ibid., 30, pp. 307, 507 and preceding abstract], carries a more abundant bacterial flora than the susceptible Reward. Those of the *Bacillus subtilis* type, usually antibiotic to *H. sativum*, were predominant. Certain bacteria from wheat were antibiotic to *B. subtilis*. When the antibiotic bacteria were removed infection was readily effected and disease development was rapid in the seedlings. Conversely, the application of cultures of these bacteria to seed gave good control of seedling infection. Healthy and diseased wheat roots differ in amino-acid content and varietal differences in catalase content may indicate the degree of natural resistance or susceptibility to root rot. All 36 varieties of winter wheat inoculated at Cowley, Alberta, in late autumn with the pathogenic, low-temperature basidiomycete [ibid., 28, p. 442; 30, p. 508] were killed. Under the same conditions *H. sativum* and *Fusarium culmorum* caused very little damage. Infection of lucerne by the winter crown rot organism [an unidentified basidiomycete: loc. cit.] was obtained for the first time in the controlled temperature rooms at Lethbridge. Good control of lucerne foliage and stem spotting caused by *Ascochyta imperfecta* [cf. ibid., 30, p. 54] was given by two applications of perenox during flowering.

In 1950 there was a sudden and widespread occurrence of race 7 of oat stem rust [*Puccinia graminis*: ibid., 30, p. 604]. The Garry variety possesses resistance but is susceptible to Victoria blight (*Helminthosporium victoriae*) [cf. preceding abstract]; some recent Garry derivations are resistant to the latter and to all races of stem rust at present known to occur in Canada. *H. victoriae* on oats was found for the first time in Alberta [cf. ibid., 27, p. 554], where it occurred as a prematurity blight in a plot of Garry at Lethbridge.

In 1949 seed growers at Kelvington, Saskatchewan, put into operation an automatic apparatus for the hot water treatment of barley seed against true loose smut [*Ustilago nuda*: ibid., 30, pp. 102, 461, 605], technical advice and supervision being provided by the Dominion Laboratory of Plant Pathology, Saskatoon. Loose smut was almost completely controlled in 20 fields sown, but embryo tests showed that some infection of the new seed took place, probably from smutty barley in the vicinity.

Fusarium moniliforme [*Gibberella fujikuroi*: see below, p. 60] and *Diplodia zeae* [ibid., 24, p. 493] proved highly pathogenic when inoculated on to the silks of 12 inbred lines of dent maize in the field; both fungi were frequently isolated from apparently normal seed [cf. ibid., 30, p. 603].

Flax wilt [*F. lini*: ibid., 30, p. 307] is a serious problem in parts of Quebec; certain lines of Stormont Cirrus selected from plants apparently resistant under greenhouse conditions proved highly resistant when grown in a wilt nursery.

Assembled data from five tests in different parts of Canada on the control of potato late blight [*Phytophthora infestans*: cf. ibid., 30, pp. 243, 451, 625] showed that Bordeaux mixture gave the best results on the foliage, though dithane D-14 was nearly as effective. Against tuber rot Bordeaux mixture and basicop ranked

first and dithane D-14 second. Highest yields came from plots treated with preparations containing zinc (dithane D-14 plus zinc sulphate; crag 658).

Exposure of jute potato bags contaminated by the ring rot organism [*Corynebacterium sepedonicum*: cf. ibid., 30, p. 533 and preceding abstract] in a single layer between two panels of commercial infra-red electric lamps, showed that not less than 90 seconds' exposure and temperatures not below 425° F. were necessary to kill the organism. Commercial quaternary ammonium compounds at 1:100 were bactericidal even at low temperatures. Carboxide (10 per cent. ethylene oxide) killed *C. sepedonicum* in the centre of bales of 500 bags when a dosage of 80 mg. per l. of space for 24 hours was used.

Of 395 potato seedlings tested for resistance to leaf roll [cf. ibid., 29, p. 143; 30, p. 308] only one showed some resistance. Of 3,500 new seedlings tested 50 survived late blight under extreme conditions in a blight test chamber [see below, p. 77]. Of 3,255 seedlings tested for resistance to common scab [*Actinomyces scabies*: cf. ibid., 29, p. 143] 30 proved highly resistant after repeated trials. Of 61 seedlings tested for resistance to *C. sepedonicum* one appeared resistant. In Canada-wide trials two seedlings, Canso and Keswick, recently introduced to the trade, showed high resistance to blight and mild mosaic [? virus A: ibid., 30, p. 308]. In field trials in 1950 in Newfoundland, Keswick developed no wart disease [*Synchytrium endobioticum*: loc. cit.], to which Canso was highly resistant. The virus of witches' broom of potato [ibid., 29, p. 273] was transmitted by grafting with scions from infected U.S.D.A. seedling 41956 to *Cyphomandra betacea* and Bonny Best tomatoes.

A strain of tobacco mosaic virus able to induce a severe necrotic response in certain tobacco varieties appeared in Ontario tobacco fields; it produced a chlorotic mottle on, and stunting and distortion of, varieties carrying the *n'* factor.

Infection of carrot roots by black rot [*Stemphylium radicinum*: ibid., 22, p. 340; 26, p. 405] resulted when they were inoculated after, but not before, mid-July, and occurred regularly thereafter. Increase in susceptibility was correlated with increase in water-soluble solids in the roots.

Studies at Charlottetown indicated that biologic strains of the club root organism [*Plasmodiophora brassicae*: cf. ibid., 29, p. 342; 30, p. 100] exist in the Maritime Provinces. Experiments were carried out using equal quantities of spores from affected Wilhelmsburger swedes grown at Nappan, Nova Scotia, and from affected Laurentian from Bunbury, Prince Edward Island. Wilhelmsburger in club-root-free soil incorporating the Bunbury inoculum developed no infection, though 58·2 per cent. Ditmar plants were affected; in soil containing the Nappan inoculum the figures were 98·7 and 83·3 per cent., respectively. A field experiment at St. Alban, Quebec, clearly indicated that bacterial soft rot [*Erwinia carotovora*: cf. ibid., 16, p. 359: 20, p. 189] of swedes may be associated with brown heart [boron deficiency: ibid., 30, p. 16]. Where boron was extremely deficient the roots were seriously affected with brown heart and many showed bacterial soft rot, though roots given adequate borax were free from both diseases.

In experiments on the control of apple scab [*Venturia inaequalis*: ibid., 28, pp. 441, 525; 29, p. 106; and below, p. 67] conducted in south-western Quebec under conditions highly favourable to infection, of the four fungicides tested as protectants, crag 541 C gave the best control, with only 5 per cent. fruit infection, but ferbam gave good results and, judged by the number and weight of the apples harvested, had the most favourable influence on the tree. As eradicants applied to young apple trees (*a*) within 60 hours after fresh infections had become possible and (*b*) after the new infections were visible on the foliage, tag 331 [ibid., 30, p. 326] gave the best results, followed by puratized agricultural spray and lime-sulphur (2 gals. per 100 gals. water). Eradicants appear unpromising except as supplements to the protectant spray schedule when unfavourable weather has delayed application of the regular schedule. In trials at St. Catherines primary scab infection

was controlled by all treatments, though the results were definitely superior when tag, phygon, and orthocide (SR406) [ibid., 30, p. 52 and below, p. 67], which possess eradicant properties, were applied. The outstanding result was the excellent control of late pin-point fruit scab obtained with Bordeaux $2\frac{1}{2}$–5–100 in the third cover spray.

The new cherry variety, Van, widely planted in British Columbia, was demonstrated to be a symptomless carrier of little cherry virus [ibid., 30, p. 376]. Further experiments again demonstrated that *Prunus emarginata* var. *mellis*, growing at Willow Point, also acts as a symptomless carrier. Little cherry with the very mild chronic symptoms found in the Creston Valley [cf. ibid., 29, p. 349] was readily transmitted, producing severe shock symptoms.

In older vineyards dead arm [*Cryptosporella viticola*: cf. ibid., 30, p. 557] causes loss of much bearing wood and, in many cases, of whole vines. Field data indicated that inspection early in the season for irregularities in shoot growth is a more reliable means of detecting infection than a search conducted after foliage symptoms have appeared. The lesion formed must be accurately located to determine what part of the vine is to be removed. As lesions may treble their size in a year they should be removed immediately.

Strains of tobacco ring spot virus were repeatedly isolated from *Gladiolus* plants showing symptoms of ordinary mottling [cf. ibid., 30, p. 416]. *Corynebacterium fascians* [cf. ibid., 29, p. 563], not previously reported from Canada, was isolated at Ottawa from a malformed *Gladiolus* corm received from Nipawin, Saskatchewan. Under conditions exceptionally favourable to scab [*Bacterium marginatum*: cf. ibid., 27, pp. 421, 567] corm treatments with mercuric chloride (1 in 1,000) and lysol (3 in 500) had little effect on incidence at Ottawa.

Strain-specific and polyvalent phages for *Pseudomonas pisi* have been isolated and will be used to detect internal infection of peas by the phage-plaque-count method [cf. ibid., 30, p. 363].

In *in vitro* tests terramycin [ibid., 30, p. 281] was the most effective antibiotic against *Pseudomonas* (nine species) and aureomycin [loc. cit.] against *Xanthomonas* (15) and *Corynebacterium* (six).

Plant protection work in India during 1949-50.—*Plant Prot. Bull., New Delhi*, 2, 3, pp. 31–43, 1950.

During the period under review, 300 guava trees were eradicated in Ajmer to prevent the spread of a newly recorded disease, probably of virus origin.

Complete control of potato blight [*Phytophthora infestans*: *R.A.M.*, 30, p. 262] was secured over an area of about 717 acres in Assam by spraying with Bordeaux mixture or dithane, resulting in an average yield increase of some 25 maunds [1 maund = 37·327 kg.] per acre. Severe local attacks of *Colocasia* blight (*P. colocasiae*) [ibid., 27, p. 451] were effectively combated by spraying with perenox.

In Bombay the incidence of rice blast (*Piricularia oryzae*) [ibid., 24, p. 472 *et passim*; C.M.I. map No. 51] in field crops and nursery beds covering an area of 2,355 acres was reduced by an average of 40 per cent. through treatment with 3–3–50 Bordeaux mixture.

W. W. Mayne reports virulent infection of cabbage by club root (*Plasmodiophora brassicae*) [ibid., No. 101] in the high ranges of Travancore, where the disease was hitherto unknown.

Informe del Instituto Agropecuario Nacional, Guatemala, por el período de enero 1948 a junio 1949. [Report of the National Institute for Agriculture and Livestock, Guatemala, for the period January, 1948, to June, 1949.]—136 pp., 29 figs., 1 graph, [? 1949. Received December, 1951. English translation.]

On p. 97 of this report it is stated that according to the results of the first-year

trials at Tiquisate in 1949 there are many varieties of rice in Guatemala which resist *Piricularia oryzae* [*R.A.M.*, 30, p. 123] and *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: ibid., 29, p. 582], or are completely immune.

The plant pathology department reports (p. 123) that of 133 wheat varieties grown at the Labor de Ovalle substation 25 were immune from stem rust (*Puccinia graminis tritici*) [ibid., 30, p. 150]. Many varieties from the United States were highly resistant to leaf rust [*P. triticina*]. A preliminary classification indicated that race 17 of *P. graminis* was the most prevalent [cf. ibid., 28, p. 329]. Of 40 imported oat varieties all except four were resistant to stem rust, whereas local varieties were severely attacked.

All small-farm [*Hevea*] rubber plantings are being top budded with clones resistant to the South American leaf disease (*Dothidella ulei*) [ibid., 30, p. 142]. The information on *Cinchona* diseases has already been reported [ibid., 30, pp. 388, 628].

Mehta (P. R.). **Some new diseases of plants of economic importance in the Uttar Pradesh.**—*Plant Prot. Bull., New Delhi*, 2, 3, pp. 50–51, 1950.

Important new diseases recently observed in Uttar Pradesh, India [cf. *R.A.M.*, 30, p. 510], include leaf spot of the widely cultivated durum wheat varieties, e.g., Bansi, C.P., and Bansipatti 808, caused by a species of *Alternaria*. Typical symptoms developed in inoculated plants after four to six days, and there are indications that the pathogen is seed-borne [ibid., 30, p. 603].

A powdery mildew (*Oidiopsis* sp.) of *Zizyphus jujuba*, first noticed at Kanpur in 1946, is widely distributed and appears to be particularly severe in the western districts of the province, causing a brown discoloration and shedding of the young fruits. The course of infection extends from November to April, and there is reason to believe that the mycelium overwinters in the new shoots arising annually during February. One application of sulphur dust in December gave satisfactory control in an orchard trial.

Zonate leaf spot of sorghum (*Gloeocercospora sorghi*), causing symptoms identical with those reported from the United States [ibid., 29, p. 557], seems to be prevalent. One of the two species of *Colletotrichum* associated with spotting and decay of papaw fruits has oval or cylindrical spores with rounded ends, while those of the other are falcate. Infection by the former results in the formation of depressed, watery lesions, and by the latter in black, leathery, erumpent spots. Inoculation experiments with spore suspensions on the intact surfaces of green and semi-ripe fruits resulted in infection.

Feder (W. A.) & Ark (P. A.). **Wilt-inducing polysaccharides derived from crown gall, Bean-blight, and soft-rot bacteria.**—*Phytopathology*, 41, 9, pp. 804–808, 1951.

In experiments at the University of California, Berkeley, toxic complexes and their polysaccharide components derived from three phytopathogenic bacteria, *Agrobacterium* [*Bacterium*] *tumefaciens*, *Erwinia carotovora*, and *Xanthomonas phaseoli*, which do not cause wilt in their hosts, proved to be capable of inducing this effect in Russian Mammoth sunflower and Bonny Best tomato cuttings [cf. *R.A.M.*, 26, p. 443; 28, p. 363]. There would appear to be no correlation between the source of these polysaccharides and wilt-inducing properties.

Klein (B. I.). Наблюдения в фазоконтрастном и электронном микроскопах над процессом лизиса бактерий. [Observations made with phase-contrast and electron microscopes on the process of bacteriolysis.]—Природа [*Nature*], *1951*, 6, pp. 47–48, 1951.

A brief description is given of the observations made on the process of bacteriolysis and on bacteriophage [*R.A.M.*, 28, p. 57] with the help of the phase-contrast

microscope. Most Soviet research workers agree as to the endogenous origin of the bacteriophage and its formation from the bacterial cell itself.

MOHANTY (U.). **Corynebacterium fascians (Tilford) Dowson; its morphology, physiology, nutrition and taxonomic position.**—*Trans. Brit. mycol. Soc.*, 34, 1, pp. 23–24, 1951.

A study of 22 strains of *Corynebacterium fascians* [cf. *R.A.M.*, 30, pp. 145, 162, 332, 417] obtained from 15 different host plants, with a view to elucidating its systematic position, showed that except in four strains, where the predominant arrangement of the rods was in palisades, the pattern exhibited was characteristically angular, resulting in V-formations. Chains of cells and branching were not seen. In no instance was acid produced from dextrose, lactose, maltose, or soluble starch in 1 per cent. peptone water with bromothymol blue as indicator. Three strains formed a little acid from sucrose, and most formed acid from mannitol. All grew satisfactorily and produced acid from dextrose, sucrose, and mannitol in synthetic media in the absence of alkali-yielding substances. The final reaction of all cultures in all media was alkaline. Lactose supported growth of all strains, but only half formed acid, and growth with lactose was heavier where acid was formed. All strains made uncertain growth in Starr and Weiss's medium, most failing to develop in a week or giving poor growth, but with thiamine at 10 μgm./ml. good and reasonably rapid growth resulted from a small inoculum of all strains but two. Biotin was merely stimulatory. Lactate was an excellent source of carbon. All strains showed copious formation of catalase. No strain was able to grow and attack cellulose in Dubos's medium, even when supplemented with thiamine. When broth cultures one week old were heated to 65° C. for ten minutes, immediately cooled, and subcultured on to nutrient agar, no growth occurred. Milk was coagulated and peptonized by all strains. Liquefaction of gelatin was delayed and in three strains did not take place. The feeble power of forming acid from carbohydrates would seem to exclude the organism from all related genera except *Corynebacterium*, and taking the evidence as a whole, the fasciation organism would seem to be properly placed in this genus, though this is largely because for certain characteristics the limits set to the genus are so wide.

WELLMAN (F. L.). **Trip to consult on Cacao problems in Ecuador.**—*Cacao Inform. Bull.*, 1, 25, pp. 1–4, 1949. [Received December, 1951.]

The author, who visited Ecuador from 19th July to 21st August, 1949, and studied the work being done on cacao problems at the co-operative station in the Hacienda Pechilingue, near Quevedo, states that the chief diseases affecting cacao in Ecuador are witches' broom (*Marasmius perniciosus*) [C.M.I. map No. 37; *R.A.M.*, 30, p. 145] and the pod rots caused by the same fungus, *Monilia* [*roreri*: ibid., 17, p. 801; 24, p. 272; C.M.I. map No. 13], *Phytophthora* [*palmivora*: see next abstract], *Diplodia* sp. [*Botryodiplodia theobromae*: loc. cit.], *Colletotrichum* sp. [*R.A.M.*, 24, p. 272], and *Sphaeronema* sp. [loc. cit.; ibid., 4, pp. 149, 529]. The last-named is second in importance in its destructive pod-rotting effect only to *M. roreri*.

FOWLER (R. L.) & LÓPEZ R. (G. H.). **The Cacao industry of Ecuador.**—*Foreign Agric. Rep., U.S. Dep. Agric.*, 34, 48 pp., 25 figs., 1 map, 4 graphs, 2 diags., 1949. [Mimeoprinted. Received December, 1951.]

In the section of this publication (pp. 18–23) dealing with cacao diseases in Ecuador [see preceding abstract] it is reported that infection by *Marasmius perniciosus* is heaviest in February, March, and April, but a few green brooms are present throughout the year. Observations indicate that the disease appears first on the outside terminal shoots; as the season progresses, it moves into the crown,

inducing star-brooms and small, undeveloped, indurated fruits. This condition is more commonly observed in Venezuela cacao, particularly the red-pod type, than in cacao 'nacional'. It is reported, however, that once the fruit of the latter is some inches long the likelihood of its developing this type of symptom diminishes. A survey indicated a decrease in intensity of the disease from about 48 per cent. in the upper Arriba Region in the north to about 20 per cent. in the Machala Region in the south; locally, severity varies from 15 to 90 per cent. Significant among the factors reported as responsible for this wide differential are rainfall, cacao type, age of trees, shade conditions, altitude, and tree maintenance. Cacao nacional trees (except in the young stage when they are more susceptible) appear to be more resistant and uniform in their reaction to the disease than Venezuela cacao [*R.A.M.*, 17, p. 801], which is more unstable genetically and segregates into a range of types with different degrees of susceptibility. Incidence on the two types was estimated to be 30 and 35 per cent., respectively. In the Machala Region an average of approximately 40 per cent. of the shoots of the red-pod type of Venezuela were infected, as against only 15 per cent. of the yellow, which is thought to be more resistant also to *Monilia roreri*. In general, the lower-quality types, calabacillo, appear to possess more resistance than the higher quality; Blanco Calabacillo is reported to be relatively resistant.

The heaviest pod losses from *M. roreri* [loc. cit.] are reported from the more humid sections of the Arriba, where the main season of infection is from March to May, and Machala Regions (March to July), the average for all Regions being estimated at 40 per cent.; fruit losses, particularly of Venezuela, may reach 98 per cent. in some years. One of the areas where infection is least is in the Arriba Region along the Puebloviejo and Caracol rivers. Introduced varieties appear to be less tolerant than cacao nacional.

In the more humid areas some growers reported upwards of 30 per cent. damage by pod rot due to *Sphaeronema* sp.

Koshimizu (Y.) & Hirai (T.). **Studies on the snow-blight diseases of winter cereals. I. Changes in osmotic pressure and protoplasmic permeability in Wheat cells under snow.**—*Ann. phytopath. Soc. Japan*, 15, 1, pp. 21–25, 2 graphs, 1950. [Japanese, with English summary.]

Snow blight of winter cereals caused by *Typhula* [*itoana*: *R.A.M.*, 15, p. 348; cf. 30, p. 364] and species of *Fusarium*, *Pythium*, and *Sclerotinia* is widespread in Hokkaido, Tohoku, and Hokuriku, Japan. Studies on the pathological changes in the cells of the wheat leaf sheath under snow cover revealed uniformly higher osmotic values in hardy than in tender varieties, but seasonal variations in pressure under snow were not recognized. Both water and urea permeability tended to decrease gradually under snow, presumably in consequence of the physiological weakness of the plants, and to increase after melting.

Zogg (H.). **Über Mischinfektionen bei Fusskrankheiten des Getreides.** [On mixed infections in cereal foot rots.]—*Schweiz. Z. Path. Bakt.*, 13, 5, pp. 574–579, 1950.

Three types of reaction to mixed infection by wheat plants inoculated with cereal root-rotting fungi were differentiated at the Federal Agricultural Experiment Station, Zürich-Oerlikon [*R.A.M.*, 30, p. 313], namely, (1) indifference, in which the incidence of the mixed infection corresponds to that of the strongest single pathogen; (2) depression, where it is distinctly lower; and (3) intensification, when incidence is decidedly higher. It was further found necessary to make additional subgroups in (1) and (2) for (a) equally and (b) unequally strong pathogens. At the same time the reciprocal influence of the several partners was studied in pure culture on malt agar, with results differing from those of the inoculation tests, and

the investigation was extended to their filtrates on 2 per cent. malt extract and in Knop's solution.

The following results were obtained, using a scale in which a disease index of 0 per cent. represents an entirely healthy plant and 100 per cent. total necrosis. In reaction type (1a) *Leptosphaeria eustomoides* (which alone gave 59·6 per cent. infection) plus *Wojnowicia graminis* (53·5) together gave an index of 60·8 and a zone of inhibition was formed in culture; *Pyrenophora trichostoma* (16·7)+*Helminthosporium gramineum* (20·8), 24·4 and a line of demarcation between the two mycelia; and *Ophiobolus graminis* (80·2)+a new species of *Diplodina* (79·9), 83·9 and complete interpenetration of the mycelia. In (1b) *O. graminis* (67·2)+*O. herpotrichus* (43·9) resulted in a disease index of 74 and a zone of inhibition; *O. herpotrichus* (45·3)+*Leptosphaeria recutita* (21·9), 48·9 and a line of demarcation; and *O. graminis* (63·4)+*L. clavata* (16·2), 60·7 and complete mycelial interpenetration.

In (2a) *L. eustomoides* (59·6)+*H. gramineum* (52·9) the disease index was 28·1 and mycelial interpenetration was complete; *O. herpotrichus* (45·3)+*L. nigrans* (47·7), 28·5 and complete interpenetration; *L. eustomoides* (59·6)+a new species of *Phoma* (55·1), 36·6 and a line of demarcation. In (2b) the figures were *Fusarium nivale* [*Calonectria nivalis*] (80·6)+*F. tricinctum* (43·7), 64·6 and a zone of inhibition; *O. graminis* (69·8)+*Pyrenophora trichostoma* (16·7), 50·6 and a line of demarcation; and *O. graminis* (76·9)+*Ascochyta graminicola* (19·2), 52·6 and interpenetration.

In reaction type (3) the disease index for *L. linearis* (26·4)+*Hendersonia aberrans* (32·5) was 41·1 and a zone of inhibition was formed; *F. graminearum* [*Gibberella zeae*] (22·5)+*H. aberrans* (32·5), 53·5 and a line of demarcation; and *F. orthoceras* var. *longius* (1·4)+*F. sambucinum* (4·3), 22·8 and interpenetration.

The culture filtrate tests resulted in the following infection percentages: *L. eustomoides* alone 33·9, *W. graminis* alone 27·7, *W. graminis* in the culture filtrate of L. *eustomoides* 32·1, *L. eustomoides* in filtrate of *W. graminis* 8·7, mixed infection 34·1, mixed culture inoculation 32·5, and uninoculated 1·7. For *H. gramineum* (34·1) and *L. eustomoides* (33·9) mixed infection gave 5·9, mixed culture inoculation 2·7, *L. eustomoides* in *H. gramineum* filtrate 2·4, *H. gramineum* in *L. eustomoides* filtrate 3, and control 1·7, the depression consequent on the mixture being so marked as to neutralize the pathogenicity of the individual components. On the other hand, the association of *L. recutita* and *L. clavata* enhanced the virulence of either alone, as appears from the following infection percentages: *L. recutita* 28·8, *L. clavata* 33·8, mixed infection 46·8, mixed culture inoculation 51·7, *L. clavata* in *L. recutita* filtrate 33·6, *L. recutita* in *L. clavata* filtrate 28, and uninoculated 2·2.

In an experiment with several partners, the disease index for *O. herpotrichus* was 45·3, *L. nigrans* 47·7, *L. recutita* 21·9, *L. clavata* 16·1, *O. herpotrichus*+*L. nigrans* 28·5, the same two+*L. recutita* 59·5, all four together 41·9, and control 2·4. It is evidently impracticable, on the basis of these figures, to forecast the virulence of a mixed infection, which thus for all practical purposes assumes the character of a new disease.

Johnston (C. O.), Quisenberry (K. S.), & Reitz (L. P.). **Reaction of hard red winter Wheats to bunt in uniform bunt nurseries (1943-1947).**—*Agron. J.*, 43, 2, pp. 61–66, 1951.

During the period from 1943 to 1947, in continuation of previous investigations, 155 hard red winter wheat varieties and strains were tested for their reaction to bunt [*R.A.M.*, 30, p. 221] using physiologic races of *Tilletia foetida* for the nurseries in Texas, Oklahoma, Kansas, Nebraska, and Colorado, while in those of Montana, Maryland, and West Virginia the same species and *T. caries* were employed. In 1944 and 1946 data in respect of dwarf bunt [ibid., 29, p. 295] on 85

varieties were obtained in Utah and Montana. No variety or selection was entirely free from bunt at all stations, but six, viz. (Chieftain × Oro-Tenmarq; Kawvale-Tenmarq × Comanche; (Sel. 29–34–275 × Fronteira) × (Sel. 29–34–275 × Comanche, C.I.12504); (Sel. 29–34–275 × Fronteira) × (Sel. 29–34–275 × Comanche, Denton, Texas 172–43–211); Marquillo-Oro × Comanche, and Oro × Turkey-Florence, averaged only a trace over the five-year period, while incidence on 65 was as low as or lower than Oro (average 6 per cent.), a resistant parent of most of the selections. Relief, Hussar, and Ridit contracted an average of less than 10 per cent. dwarf bunt (1, 1, and 8 respectively), while Chieftain × Martin-Tenmarq (Am. 42–2511) averaged only a trace, and Martin-Tenmarq × Kharkof (Am. 41–2510), (Quivira × Martin–Tenmarq) × Hope-Med., Chieftain × Martin-Tenmarq (Am. 42–2500), and Martin-Tenmarq × Kharkof (Denton, 42–2862) 1 each.

Hard red wheats with resistance to bunt now in commercial cultivation include Comanche, Pawnee, Nebred, Oro, Ridit, Rio, Minturki, Marmin, Yogo, Minter, Relief, Cache, and Wasatch.

Dunbabin (T.). **New Australian Wheat variety.**—*New Commonw.* (formerly *Crown Colonist*), 22, 6, p. 412, 1 fig., 1951.

A new wheat variety highly resistant to stem rust [*Puccinia graminis*: *R.A.M.*, 30, p. 558] and at present named B.K.P. has been developed at Glen Innes, New South Wales. It originated from a Kenya-Baringa (1930) hybrid crossed with Pusa III and combines the stem rust resistance of Kenya with Baringa's high yield and the baking quality of Pusa III. As soon as enough seed is available it is to be grown on a commercial scale.

Hafiz (A.). **Physiologic specialization in Urocystis tritici Koern.**—*Phytopathology*, 41, 9, pp. 809–812, 1951.

At the Imperial College of Science and Technology, South Kensington, London, the seed of 12 wheat varieties was inoculated with each of 11 collections of *Urocystis tritici* [*R.A.M.*, 28, p. 387] and sown in the greenhouse on 15th June and 19th October, 1947, and 10th March, 1948; during the pre-emergence period the soil temperature ranged from 15° to 20° C. On the basis of varietal reaction the physiologic races comprised in the test material fell into four groups, namely, (1) represented by collection No. 1 from Kansas: U.S. race 1; (2) collections Nos. 2 (Washington State), 3 and 4 (Italy), and 5 (Australia): U.S. race 2; (3) collections Nos. 6, 7, and 8 (China), and 9 (Cyprus); and (4) collections Nos. 10 and 11 (Pakistan).

The reactions of two selections of an Oro × Federation hybrid demonstrated the racial difference between the two American collections [ibid., 22, p. 245]. The four collections constituting race 2 infect the same varieties, i.e., Federation, Oro × Federation, Oro × Federation–26, Oro × Federation–38, and a nameless Chinese wheat. The last-named is resistant to the physiologic races of *U. tritici* occurring in southern China [ibid., 24, p. 496], which are thus evidently distinct from race 2. The Cyprus collection resembles the three samples from China, none of the four being pathogenic to any of the varieties included in the tests. The collections from Shensi and Szechwan probably represent Chinese races 2 and 3, respectively. The two identical collections from Pakistan appear to constitute a separate race, being non-pathogenic to all the varieties except Punjab T-9.

Kole (A. P.). **De bestrijding van stuifbrand bij Tarwe en Gerst.** [The control of loose smut in Wheat and Barley.]—*Tijdschr. PlZiekt.*, 57, 2, pp. 65–72, 4 graphs, 1951. [English summary.]

The modified hot-water treatment recommended for the control of the wheat and barley loose smuts (*Ustilago tritici* and *U. nuda*) in Holland [*R.A.M.*, 29, p. 206] is

somewhat complicated, difficult to apply, and tends to cause severe injury to the seed. Investigations were accordingly conducted at the Phytopathological Research Institute, Wageningen, to determine the possibility of replacing this method by that of the single bath, advocated by Gassner (*Arch. dtsch. landw. Ges.*, 1, pp. 78–81, 1948) and Flensberg (*Phytopath. Z.*, 16, pp. 1–40, 1949), in which the seed is immersed for 2½ hours in water heated to 46° C. For wheat the single-bath treatment at 46° was less effective than the modified hot-water treatment; at 47° it was equally effective but injurious to the seed. The low incidence of barley loose smut precluded definite conclusions as to the efficacy of the single bath.

Fischer (G. W.). **Induced hybridization in graminicolous smut fungi. I. Ustilago hordei × U. bullata.**—*Phytopathology*, 41, 9, pp. 839–853, 4 figs., 1951.

This is an expanded account of the author's studies at the Washington Agricultural Experiment Station on hybridization between two graminicolous smuts, *Ustilago hordei* and *U. bullata*, the substance of which has already been presented in preliminary notes [*R.A.M.*, 27, p. 283].

Schaller (C. W.). **The effect of mildew and scald infection on yield and quality of Barley.**—*Agron. J.*, 43, 4, pp. 183–188, 1951.

Light mildew (*Erysiphe graminis*) [*R.A.M.*, 30, p. 222] infection of brief duration, confined to the early phases of plant growth, reduced the yield of Atlas barley in California by 2·6 and 2·3 bush. per acre, equivalent to 6·6 and 3·8 per cent. of the total yield, in 1947 and 1949, respectively, reduction in kernel number per spike being the decisive factor in the decrease. Heavy mildew infection with profuse sporulation and foliar chlorosis caused yield reductions averaging 6·3, 6·8, and 5·5 bush. per acre, respectively, in 1947, 1948, and 1949, equivalent to 17·6, 14, and 8·1 per cent. of the total yields. The maximum reduction in any one location was 21·4 bush. (27·4 per cent.) in 1948. In 1949 when the plants fully recovered from the initial attack of mildew, reduced kernel number was accompanied by an increase in weight.

The effect of scald (*Rhynchosporium secalis*) [ibid., 30, p. 462] paralleled that of mildew. In 1948 a yield reduction of 16 per cent., consequent on reduced kernel number and weight, was registered in the infected plots, the maximum decrease at any one location being 18·4 bush., representing 35 per cent. of the total yield. Comparable data were obtained in 1945, with an average yield reduction of 22·3 per cent.

McKeen (W. E.). **A preliminary study of Corn seedling blight in southern Ontario.**—*Canad. J. Bot.* (formerly *Canad. J. Res.*, Sect. C.), 29, 2, pp. 125–137, 5 pl., 1 graph, 1951.

Isolation studies at the Plant Pathology Laboratory, Harrow, Ontario, of the organisms responsible for root degeneration of maize in southern Ontario showed that seedling blight, the major factor causing poor stands and reduced yield, may be due to *Pythium arrhenomanes* [*R.A.M.*, 30, p. 564], *P. debaryanum*, *Fusarium moniliforme* [*Gibberella fujikuroi*], *F. graminearum* [*G. zeae*: loc. cit.], or *Rhizoctonia* [*Corticium*] *solani* [ibid., 24, p. 54; 29, pp. 109, 555]. Of these the most important economically and widespread throughout the whole maize-growing area is *P. arrhenomanes*, which produces millions of zoospores in moist soil. In the field it seldom kills the plant, as maize puts out new adventitious roots when the older ones are destroyed. *G. zeae* was found only once. *G. fujikuroi* was present in most lesions, but is mostly a secondary invader, becoming parasitic only if ideal environmental conditions are maintained for several weeks. Studies in refrigerated rooms showed that temperature had a greater effect on wheat and maize than it had on *P. arrhenomanes*, attack by this fungus being greatest at low temperatures

with maize and at high temperatures with wheat. *C. solani* was widely distributed but of little economic importance. *P. debaryanum* was widespread but not very virulent, causing only slight stunting even under ideal conditions.

The investigation showed also that reduction in size and vigour of seedling maize plants is characteristic of injury by *P. arrhenomanes* under field conditions, though the fungus seldom causes reduced germination or post-emergence death. The affected plants often show marked recovery, but as the potentialities of the plants are determined during the first part of the growing season, injury is expressed in reduced yield, and sometimes no grain develops on the dwarfed plants. The disease appears to be favoured by high soil moisture; providing other conditions are favourable severity increases with decrease in temperature.

In the author's experiments arasan seed treatment gave only seed protection, dwarfing not being prevented [cf. ibid., 28, p. 391].

Pendleton (J. W.), Dungan (G. H.), Koehler (B.), Bigger (J. H.), Lang (A. L.), Jugenheimer (R. W.), & McKibben (G. E.). **Illinois tests of Corn hybrids in wide use in 1950.**—*Bull. Ill. agric. Exp. Sta.* 544, pp. 103–136, 1 fig., 1 map, 1951.

In the report on disease damage (pp. 107–111) in the 1950 maize hybrid tests at eight centres in Illinois [cf. *R.A.M.*, 29, p. 556] it is stated that Stewart's disease (*Bacterium* [*Xanthomonas*] *stewarti*) [loc. cit.], present as a leaf blight in many fields in the southern two-thirds of the State, was about as severe as in 1949. Northern leaf blight (*Helminthosporium turcicum*) [loc. cit.] caused the worst attack ever recorded in Illinois. Leaf infections occurred in every field in the State, but were particularly severe in the southern quarter and in the east as far north as Watseka. Losses from stalk rots, though above the average, were about the same as in 1949 and again greatest in the southern half of the State. Premature death from stalk rot was caused mainly by *Diplodia zeae*, but the chief cause of broken stalks at harvest was *Gibberella zeae*, damage from the latter being the most pronounced since 1946. The average ear rot damage [due to various fungi: loc. cit.] for all fields was 2·86 per cent., the highest figure since 1944. Rust [*Puccinia sorghi*: ibid., 10, p. 180; 30, p. 563], usually of very minor importance in field maize, was more prevalent than ever before, resulting in appreciable damage.

Maramorosch (K.). **Mechanical transmission of Corn stunt virus to an insect vector.**—*Phytopathology*, 41, 9, pp. 833–838, 1 fig., 1951.

At the Rockefeller Institute for Medical Research, New York, maize stunt virus [*R.A.M.*, 30, p. 153] from viruliferous *Dalbulus maidis* was injected at a dilution of 10^{-2} into virus-free leafhoppers of the same species. Insect to insect transmission was successful. In another test leafhoppers injected with virus in juice from a diseased maize plant became infective. Maize stunt has not yet been mechanically transmitted from plant to plant.

Hoppe (P. E.). **A glass-tumbler-paper doll technique for seed Corn incubation and germination tests.**—*Phytopathology*, 41, 9, pp. 856–858, 1 fig., 1951.

A further simplification in the glass tumbler method of maize seed incubation in cold soil for disease tests [*R.A.M.*, 31, p. 14] eliminates the need for a greenhouse. Kernels removed from the tumblers are placed on moist paper towels which are rolled into 'rag dolls' and put in covered metal pans at room temperature for about four days, whereupon the incidence of germination is recorded. This simple, reliable, and exceptionally quick procedure is satisfactory for measuring (1) relative efficiency of different dust seed treatments, (2) toxicity of fungicides at varying dosages, (3) differences in resistance to disease among inbred lines of maize, and (4) influence of rough handling on disease development.

Warren (J. R.). **The use of radioisotopes in determining the distribution of Bacterium stewartii Erw. Smith within Corn plants.**—*Phytopathology*, 41, 9, pp. 794–800, 1 fig., 1951.

In experiments at Duke University, Durham, North Carolina, the growth and reproduction of *Bacterium* [*Xanthomonas*] *stewarti* in potato dextrose broth and brain-heart infusion media were not appreciably reduced by radio-activity concentration (up to 7·4 millicuries per ml.) permitting the assimilation of readily detectable amounts of radio-active phosphorus. The rate of spread of the pathogen in inoculated maize plants was shown to be correlated with the rate of host transpiration. Using radio-active bacteria, no significant difference was found in the rate or extent of diffusion of *X. stewarti* in susceptible and resistant inbreds. The results of these tests are considered to demonstrate the practicability of using radio-active tracer elements in phytopathological studies.

Aldrich (D. G.) & Coony (J. J.). **Lemon response to phosphate. Part I. Vegetative growth stimulated by soil applications of phosphate to trees showing leaf symptoms of deficiency. Part II. Substantial increase of yield followed application of phosphate in trials in two countries.**—*Calif. Agric.*, 5, 2, pp. 5, 12; 3, p. 8, 1 fig., 1951.

In recent experiments in Ventura and San Diego Counties, California, in the correction of phosphorus deficiency in Eureka lemons [*R.A.M.*, 29, p. 98], phosphate fertilizer treatments in each of four locations gave marked improvement within four months. Leaves suffering from phosphate deficiency show brown to black spots, generally circular but sometimes coalescing to form an elongated oval spot. Yield trials showed marked increases following phosphate fertilization. The symptoms have never been observed on orange trees.

Grant (T. J.), Costa (A. S.), & Moreira (S.). **Tristeza disease of Citrus in Brazil.**—*Calif. Citrogr.*, 36, 8, pp. 310–311, 324–326, 328–329, 1 fig., 1951.

In this general report on tristeza disease of citrus in Brazil [*R.A.M.*, 30, pp. 409–413] the results of research work are discussed in relation to the close similarity between this disease, a serious lime disease in the Gold Coast [ibid., 29, p. 97], and stem-pitting of grapefruit in South Africa [ibid., 30, p. 267]. The association of stem-pitting symptoms with tristeza infection in grapefruit, certain limes, and other citrus varieties may aid in the early diagnosis of the disease, which should be tested further by budding on to Key lime seedlings [ibid., 30, p. 566]. The wide range in the reaction of lime and lemon varieties to tristeza and the indicated importance of differences in hybrid plant reactions are discussed. Results obtained in the past year have revealed tristeza symptoms on some of the sweet orange tops on trifoliate [*Poncirus trifoliata*] hybrid rootstocks [loc. cit.]. Of the seven citranges under test, Saunders appears to be the least tolerant and most unsatisfactory as a rootstock. Initial symptoms have also been observed on Barao sweet orange tops on Uvalde, Morton, and Troyer citranges. Of seven citrumelos PI–4604 and Winterhaven are the most susceptible, and rootstocks of a citremon and the citrangor PI–42681 are no longer considered tolerant. Trifoliate hybrids should therefore be used on a limited scale until further knowledge is obtained.

Wallace (J. M.). **Recent developments in studies of quick decline and related diseases.**—*Phytopathology*, 41, 9, pp. 785–793, 2 figs., 1951.

This is a recapitulation of information on recent advances in the recognition of quick decline and related diseases of citrus already noticed from another source [*R.A.M.*, 30, p. 565]. These developments clearly emphasize the unexpected complications incidental to the control of this type of disease, but the knowledge

gained from the studies may well prove useful in the large-scale varietal and root-stock tests now in progress in Brazil [see preceding abstract] and the United States.

Lamour (R.). **Le Mandarinier : ce centenaire algérien !** [The Mandarin: that Algerian centenarian!].—*Fruits & Primeurs*, 21, 226, pp. 197–200, 6 figs., 1951.

Discussing the value of the mandarin tree, grown in North Africa since 1850, the author mentions Fawcett's recommendations in 1936 that mandarin stocks should be used to build up resistance to 'mal secco' [*Deuterophoma tracheiphila*: cf. *R.A.M.*, 15, p. 574; 30, pp. 317, 465]. This practice has resulted in an eightfold increase in the area planted with mandarins round Palermo, Sicily. Both the ordinary and the Cleopatra mandarin are satisfactory stocks to use against quick decline [cf. ibid., 27, p. 521 and preceding abstract].

In 1925 a planting of mandarins grafted on sour orange in 1919 was double-grafted with Thomson Navel orange. Fifteen years later many of the trees showed symptoms of scaly-bark psorosis [ibid., 30, p. 465] on the Navel wood; after 26 years of double-grafting the cortical lesions have become arrested at the graft union on all except two of the trees (1 per cent. of the planting), where they are present only on the part touching the Navel graft. Some of the trees have grown a mandarin branch with no symptoms.

Blind pocket psorosis [loc. cit.] has been present in Algeria for some years and is spreading; mandarins almost everywhere have long been affected.

Brichet (J.). **Le 'Citrus blast' et le 'black pit'.** [Citrus blast and black pit.]—*Fruits & Primeurs*, 21, 226, pp. 195–196, 2 figs., 1951.

During the winter of 1950–1 long periods of cold rain, with strong northerly and north-westerly winds and heavy falls of hail in French North Africa, were followed by serious outbreaks of citrus blast and black pit (*Pseudomonas citriputeale*) [*P. syringae*: cf. *R.A.M.*, 30, p. 464]. In attempts to control the blast phase on leaves and branches local growers resort to vigorous pruning, which only aggravates the disease the following winter by reducing protection against severe weather. The author has secured rapid recovery of affected trees by light pruning after picking, followed by spraying with a mixture containing (per cent.) 0·25 kg. zinc sulphate, 0·15 kg. lime, and 0·05 kg. commercial adhesive.

Saccas (A. M.). **La trachéomycose (carbuncullariose) des Coffea excelsa, neo-arnoldiana et robusta en Oubangui-chari.** [Tracheomycosis (carbuncullariosis) of *Coffea excelsa*, *neo-arnoldiana*, and *robusta* in Ubangui-chari.]—*Agron. trop.*, 6, 9–10, pp. 453–506, 2 pl., 19 figs., 2 diags., 2 graphs, 1951.

This is a full account of symptomatological, cultural, morphological, and anatomical studies on tracheomycosis of coffee trees (*Gibberella xylarioides*) in the Belgian Congo [*R.A.M.*, 30, pp. 228, 466]. It attacks *Coffea dewevrei* and wild varieties of *C. excelsa* in their natural habitat, in addition to those already recognized as susceptible. The optimum temperature for conidial germination is 25° to 26° C., the maximum 31° to 32° and the lethal between 35° and 40°. The corresponding figures for ascospore germination are 26° to 27°, 32°, and 40°, respectively. Both conidia and ascospores require humidity at saturation level for germination while ascus dehiscence and ascospore projection are favoured by alternate humidity and dryness. The incubation period before the primary symptoms appear on two- to three-month-old trees varies from six to ten days, from one to three months with those six months to two years old, two to three months with three- to five-year-olds, and four to six months with seven- to ten-year-olds. The susceptibility of *C. excelsa* and *C. neo-arnoldiana* is due to the inability of the cells to form suberized layers to withstand fungus penetration.

Control measures [ibid., 29, p. 617] include disinfecting wounds with a concentrated copper sulphate solution to destroy conidia and ascospores, spraying with Bordeaux mixture, burning all dead and dying trees and debris to reduce infection foci, and painting tree trunks with a sodium arsenate mixture to prevent damage by termites and borers.

Neal (D. C.) & Newsom (L. D.). **Soreshin of Cotton and its relationship to thrips damage.**—*Phytopathology*, 41, 9, p. 854, 1951.

In the course of studies on the control of tobacco thrips (*Frankliniella fusca*) in the Red River Valley area of Louisiana during 1950, it was observed that fewer cotton plants were attacked by sore shin (*Rhizoctonia* [*Corticium*] *solani*) [*R.A.M.*, 28, p. 65] on the plots where the insects were effectively combated than on the untreated. Thus, of 200 plants collected at random from a treated plot, 153 were healthy, 30 mildly, 13 moderately, and four severely infected by *C. solani*. Among the same number from an adjoining untreated plot the corresponding figures were 30, 51, 44, and 75. Moreover, the treated plants had 70 per cent. more leaf area than the controls. This reduction is responsible for a debilitated plant with enhanced susceptibility to sore shin.

Hutchinson (J. B.) & Manning (H. L.). **Recent progress in Cotton breeding in Commonwealth Territories in Africa and in the Anglo-Egyptian Sudan.**—*Brit. agric. Bull.*, 4, 15, pp. 169–174, 5 figs., [1951].

The authors review recent progress in cotton breeding (including reaction to diseases) in Commonwealth Territories in Africa and in the Anglo-Egyptian Sudan [cf. *R.A.M.*, 30, p. 156], the main points dealt with being the improvement of the African Upland cottons, the development of Egyptian cottons, and the contribution of genetic research to the subject. The paper concludes with a section on the planning of cotton breeding.

Goodey (J. B.). **A new species of Hyphomycete attacking the stem Eelworm Ditylenchus dipsaci.**—*Trans. Brit. mycol. Soc.*, 34, 3, pp. 270–272, 1 fig., 1951.

A full description is given of *Verticillium sphaerosporum* n. sp., found attacking and killing the eelworm *Ditylenchus dipsaci*, causing disease of a garden variety of *Calceolaria integrifolia* at Kilmarnock, Scotland. The spores of the fungus have adhesive coats.

Duddington (C. L.). **The ecology of predacious fungi. I. Preliminary survey.**—*Trans. Brit. mycol. Soc.*, 34, 3, pp. 322–331, 1951.

An account is given of the occurrence of predacious fungi on various kinds of substrata (leaf mould, rotten wood, partly decayed plant remains, dung, and moss) from different places in England [cf. *R.A.M.*, 29, pp. 303, 618; 30, p. 466]. The data concerning a number of collections are tabulated to indicate the species found in the different types of material. An analysis of 135 collections shows that these fungi are abundant and widespread, particularly among bryophytes. The distribution of 34 species on different substrata is tabulated and the use of quadrats in studying their distribution described. Representatives of all the important genera except *Bdellospora* and *Endocochlus* were found, and some species were ubiquitous.

Sussman (A. S.). **Studies of an insect mycosis. I. Etiology of the disease.**—*Mycologia*, 43, 3, pp. 338–350, 3 figs., 1951.

Studies were made in the Department of Botany, University of Michigan, on a disease which occurred in 1947 among pupae of the giant silkworm, *Platysamia cecropia*, being used for experimental purposes. It caused blackening and death of

the insects and was due to infection by *Aspergillus flavus* [cf. *R.A.M.*, 9, p. 591; 18, p. 310; 26, p. 200] and *A. luchuensis* [cf. ibid., 12, p. 397; 30, p. 483]. Infection of the insect at each stage in the life-history by *A. flavus* was ascertained to be possible, the larvae being infected relatively easily. Although there are effective mechanical barriers to the entrance of *A. flavus* into the pupae, once these barriers are breached and the fungus enters the body cavity fatal infection results.

Dimock (A. W.). **Bud transmission of Verticillium in Roses.**—*Phytopathology*, 41, 9, pp. 781–784, 1951.

In inoculation experiments on roses at the Department of Plant Pathology, Cornell University, New York, infection was definitely established and confirmed by isolation in at least 11 (35 per cent.) of the 31 plants budded from canes attacked by *Verticillium albo-atrum* [*R.A.M.*, 22, p. 219], and in eight (62 per cent.) of the 13 inoculated from agar cultures. The inclusion of cases in which symptoms were clear-cut but isolation attempts unsuccessful would raise these percentages to 61 and 77, respectively. None of the 12 plants budded with healthy material contracted the wilt. Three to four months after inoculation the fungus could not be isolated from any point below either the diseased buds or the sites of culture insertion, though it was readily recovered from points 1 ft. or more up the inoculated stems. Most of the inserted buds died; a few 'took' but failed to break; while one formed a new shoot after transmitting infection to previously healthy Edith Willkie. Bud failure, however, was probably largely due to faulty technique.

The results of these tests afford unquestionable proof that buds from rose trees infected by *V. albo-atrum* may serve as inoculum for budding of susceptible varieties. It is important to recognize that systemic fungi or bacteria may be bud-transmitted. In this connexion it is pointed out that many of the features of rose streak virus [ibid., 20, p. 365] and nearly all those of rose wilt virus [ibid., 10, p. 733; 23, p. 439] are identical with the symptoms of the wilt due to *V. albo-atrum*. It is further apparent from these studies that bud transmission does not constitute acceptable evidence for the virus nature of a plant disease, though offered as such in the case of certain rose infections.

Legge (Betty J.). **A Phytophthora crown rot of Campanula.** *Trans. Brit. mycol. Soc.*, 34, 3, pp. 293–303, 1 pl., 4 figs., 1 diag., 1951.

A variety of *Campanula persicifolia* grown at Evesham for show purposes developed a grey brown to chocolate brown crown rot caused by *Phytophthora porri* [cf. *R.A.M.*, 20, p. 442, and C.M.I. map No. 204], which spread upwards into the leaf bases and flower shoots and downwards into the roots. The tissue eventually disintegrated and no instance of recovery was seen. Wound inoculations of common *C. persicifolia* and soil inoculation induced infection, *P. porri* being demonstrated in the diseased specimens. *P. porri* isolated from leek failed to infect *Campanula* and the *Campanula* fungus failed to infect leeks. Sporangia were found in soil round the affected *C. persicifolia* plants, and the evidence indicates that a normal mode of infection is from zoospores from sporangia on mycelium in the soil.

Carter (J. F.) & Ahlgren (H. L.). **Forage yields and disease development of two varieties of Smooth Bromegrass, Bromus inermis Leyss., grown under various conditions in the field.**—*Agron. J.*, 43, 4, pp. 166–171, 1 fig., 1951.

At the Wisconsin Agricultural Experiment Station four treatments (fertilizing versus no fertilizing and cutting at the hay and at the pasture stage of growth) and inoculation with *Pseudomonas coronafaciens* var. *atropurpurea* [*R.A.M.*, 2, p. 357] versus no inoculation were applied to Canadian and Parkland brome grass grown alone and with lucerne in the field.

The Canadian variety was more susceptible to the bacterium and to natural infection by brown leaf spot [*Pyrenophora bromi*: ibid., 24, p. 317] than Parkland. The average incidence of bacterial blight in all the Parkland plots was 35 per cent. less than that in the Canadian, while the corresponding figure for brown leaf spot was 50 per cent. During periods conducive to disease development forage harvested at the pasture stage was more severely infected than that harvested at the hay stage. The amount of infection was reduced by the dispersal of brome grass in associations with lucerne. It was difficult to induce the development of bacterial blight symptoms in the field by inoculation.

Potter (J. M. S.). **Report of the National Fruit Trials, 1921-1950.** *J.R. hort. Soc.*, 76, 7, pp. 240–252; 8, pp. 280–293, 4 charts, 1951.

In this report [cf. *R.A.M.*, 29, p. 31], to which H. V. Taylor contributes a foreword, it is stated that in these trials the new apple variety Melba was rather susceptible to scab [*Venturia inaequalis*: cf. ibid., 24, pp. 64, 320; 27, p. 26; 28, p. 337], though Red Melba was not. Early Laxton plum was badly affected by bacterial canker [*Pseudomonas mors-prunorum*: cf. ibid., 26, p. 159; 30, p. 618] in some areas; Black Prince was less susceptible to silver leaf [*Stereum purpureum*: cf. ibid., 23, p. 90] than was Czar. Among gages and other dessert plums Severn Cross was a little susceptible to brown rot [*Sclerotinia fructigena* and *S. laxa*: cf. ibid., 27, p. 371; 30, p. 331] but showed some resistance to bacterial canker, as did the late varieties Olympia and Marjorie's Seedling, particularly the latter.

New raspberry varieties of which virus-free stocks or those reasonably tolerant of certain viruses are obtainable include Malling Promise (formerly E.M. 51/79) and Malling Exploit (formerly E.M. 51/84) [cf. ibid., 28, p. 341; 29, p. 315], both early, and the mid-season varieties Malling Jewel (E.M. 33/54) and Malling Notable (E.M. 32/163). Stocks of the strawberry varieties Perle de Prague (first early) [ibid., 28, p. 528] and Auchincruive Climax (mid-season) [ibid., 30, p. 525] free from viruses are now available.

Tomkins (R. G.). **The microbiological problems in the preservation of fresh fruits and vegetables.** —*J. Sci. Food Agric.*, 2, 9, pp. 381–386, 1951.

In this address to the Microbiology Group of the Society of Chemical Industry on 18th April, 1951, the author surveys microbiological problems involved in fruit and vegetable preservation. He points out that the preservation of fruit [*R.A.M.*, 24, p. 421] and vegetables [ibid., 31, p. 29] involves their maintenance in a physiologically sound condition and the prevention of damage by micro-organisms, the two factors being closely interrelated. Discussing the methods used to reduce rotting, the author states that he found that South African grapes would tolerate 30 per cent. carbon dioxide [cf. ibid., 12, p. 103] for 20 to 30 days without damage and remain freer from mould attack than when stored in air. Future prospects in developing control measures are very briefly assessed.

Dullum (N.) & Rasmussen (P. M.). **Forsøg med opbevaring af Æbler 1940-1948.** [Experiments on Apple storage 1940 to 1948.]—*Tidsskr. Planteavl.*, 54, 2, pp. 249–317, 6 figs., 1951. [English summary.]

This is a detailed, fully tabulated progress report on apple storage experiments in Denmark from 1940 to 1948 [*R.A.M.*, 25, p. 123], showing the incidence (under different conditions of temperature, ventilation, and carbon dioxide supply) of physiogenic disorders, such as scald [ibid., 30, p. 571], Jonathan spot, low temperature breakdown, and brown heart, and fungal rots (*Gloeosporium album*, *Botrytis cinerea*, and *Penicillium expansum*) on a number of commercial varieties [cf. ibid., 30, p. 615]. Gradual cooling increased the likelihood of damage by scald and fungi but considerably reduced the risk of low temperature breakdown and brown

heart. For varieties susceptible to low temperature breakdown slow refrigeration is to be preferred, whereas for those not liable to this injury cooling should be effected as quickly as possible.

Chamberlain (G. C.). **Results of fungicidal trials for scab control in Ontario.**—Abs. in *Proc. Canad. phytopath. Soc.*, 18, pp. 10–11, 1951.

In Ontario microfine sulphurs are the most popular fungicides for the control of apple scab [*Venturia inaequalis*: *R.A.M.*, 26, p. 9, and above, p. 53]. Being safer to use on the trees, they have largely replaced lime-sulphur. Organic fungicides have shown promise in combination with sulphurs or in split schedules. Ferric carbamate in the cover spray programme was more effective than the sulphurs in checking secondary infection on the fruit. Mercurial fungicides gave outstanding control under serious infection conditions. SR 406 [loc. cit.] and glyoxalidine fungicide [ibid., 30, p. 477] were promising protective materials, the effects of which appeared to last well.

Zäch (C.), Kundert (J.), & Bieri (F.). **Schorfbekämpfungsversuche mit Nebelblaser im Jahre 1950.** [Scab control experiments with the mist blower in the year 1950.]—*Schweiz. Z. Obst- u. Weinb.*, 60, 4, pp. 59–67, 1 graph, 1951.

Mist blowers proved equally effective with motor sprayers for the control of apple scab [*Venturia inaequalis*] in Switzerland in 1950 [see next abstract], using copper oxychloride and cupro Maag at 0·75 per cent. for the former and 0·15 per cent. for the latter apparatus in one series and at 1·5 and 0·15 per cent., respectively, in another. The motor sprayer, however, distributed the copper rather more evenly over the leaves and fruits than the mist blower, which also operates less efficiently on steep terrain or in the presence of obstacles, and can, in fact, for the time being serve only as an adjunct to motorized equipment.

Blumer (S.). **Organische Schorfbekämpfungsmittel.** [Organic preparations for scab control.]—*Schweiz. Z. Obst- u. Weinb.*, 60, 4, pp. 67–70, 1 fig., 1951.

During 1950 tests were carried out at the Wädenswil Experiment Station, Zürich, and five other localities on the control of apple scab [*Venturia inaequalis*: see preceding abstract] on a number of sulphur-shy varieties with organic fungicides, of which the following are authorized for this purpose in Switzerland: grisard, kryptox (Sandoz), organol (Siegfried), pomarsol [pomasol: *R.A.M.*, 30, p. 327] and Präparat BB4271 (Brändli), and tiurax (Muttenz), all of which are thiram derivatives [ibid., 28, p. 461]; M555 (Maag), a carbamate; and nirit (Brändli) [ibid., 30, p. 374], with dinitrothiocyanogenbenzol as the active ingredient. Using a scale in which complete absence of scab represents 100 per cent. efficiency, the following ratings were assigned: standard spray schedule of lime-sulphur or wettable sulphur with a copper adjuvant 83·6 to 93·5 for the leaves and 92·8 for the fruit; thiram 57·1 to 89 and 80·8 to 93·8, respectively; M555 48·7 to 84·9 and 80·4, respectively; and nirit 57·9 to 91·7 and 89·4 to 98·5, respectively.

In an experiment to compare the relative efficacy of M555 and nirit (*a*) for post-blossom treatments only and (*b*) throughout the season, the ratings assigned to the former material were 77·6 and 48·7 per cent., respectively, and to the latter 66·6 and 57·9 per cent., respectively.

It is concluded from these results that the use of the expensive organic fungicides, which are seldom equally effective with the standard schedule, should be confined to the post-blossom treatment of sulphur-shy varieties, such as Danziger Kant, Sauergrauech, and Berner Rosen. M555 also gives good control of *Cylindrosporium padi* [*Coccomyces hiemalis*] on cherries [ibid., 26, p. 157].

KenKnight (G.). **The acid test for phony Peach.**—*Phytopathology*, 41, 9, pp. 829–832, 1951.

For Hutchins's method for the detection of phony peach virus in the wood of peach roots [*R.A.M.*, 30, p. 571] any moderately active acid, e.g., nitric, sulphuric, formic, phosphoric, phosphorous, sulphurous, lactic, acetic, and propionic, will serve as a 'developer.' Without dilution, the three first-named produce at 25° C. instantaneous configurations of purplish dots ('images'), which remain readable for a period roughly twice as long as that required for development. These acids may also be used in 1 to 10 per cent. solutions in methyl or ethyl alcohol. The other acids are less effective and require longer periods to produce discernible images.

Very clear images result from the application of absolute methyl alcohol solutions of trichloroacetic, oxalic, tartaric, salicylic, citric, malic, and succinic acids, listed in order as to time required for development, from seconds for the first- to a day for the last-named. The specific solvent or diluent used makes a great difference to the developing time, methyl alcohol giving a faster reaction than ethyl, which in its turn is more effective than the higher alcohols. However, hydrochloric and oxalic acids were reactive in all the liquid alcohols tested, while picric acid gave good results in benzene. Development is much accelerated by the addition of zinc chloride, potassium bromide, or sodium chloride to liquid organic acids or to methyl alcohol, whereas water retards the process, though a strong acid, such as nitric, may be diluted considerably with water.

The colour of the image depends on the strength of the acid developer. Thus, liquid inorganic acids and oxalic acid in methyl alcohol produce purplish-red to purple dots on a faintly red to purple background. Pink to red dots on a faint pink background develop in wood treated with tartaric, salicylic, citric, or malic acid. Trichloroacetic acid results in orange to brick-red dots on a yellow to orange background, and propionic acid in yellow dots on very pale yellow.

Instructions are given for the practical application of this procedure to field work. Investigations on the diagnostic value of the acid test are proceeding at the U.S. Horticultural Field Laboratory, Fort Valley, Georgia.

Controlling Strawberry virus. Mr. A. L. Abel describes the effectiveness of pestox 3 in disposing of troublesome aphides.—*Fruitgrower*, 1951, 2885, p. 665, 1951.

Addressing growers at King's Lynn, Norfolk, at the beginning of April, 1951, Mr. A. L. Abel, Technical Director of Pest Control Ltd., gave an account of pestox 3 and its use in the control of *Pentatrichopus fragaefolii* [*Capitophorus fragariae*], the only known vector of [unspecified] strawberry virus[es: *R.A.M.*, 30, p. 523]. Unlike other aphids, this species passes the entire year on the same host, breeding continuously. The disease is spread chiefly by the wingless forms moving along the runners, but is introduced into virus-free crops by the winged forms after feeding on infected plants in May to June and again from October to January. The spraying can be done for about £6. 10*s*. per acre or £8. 10*s*. for two applications.

Day (L. H.). **Cherry rootstocks in California.**—*Bull. Calif. agric. Exp. Sta.* 725, 31 pp., 20 figs., 1951.

The author summarizes the results of 25 years' observations and experiments carried out at the University of California Experiment Station, Davis, and in various parts of the State, on the behaviour of the three cherry rootstock species, Mazzard (*Prunus avium*), Mahaleb (*P. mahaleb*), and Morello (*P. cerasus*), including their relative susceptibility to diseases.

Trees on Mahaleb are less subject to zinc deficiency [cf. *R.A.M.*, 29, p. 516] in the San Joaquin Valley than those on Mazzard. Trees on both stocks in highly calcareous soils are subject to lime-induced chlorosis. Mazzard roots are semi-

resistant to *Armillaria mellea* [cf. ibid., 10, p. 323; 23, p. 25], while Mahaleb and Stockton Morello are quite susceptible. As the disease progresses slowly in Mazzard root surgery is worth while for old trees, the root bases being left exposed; in this way, girdling is retarded. Trees worked high on Mahaleb seedlings appear to be more free from bacterial gummosis cankers (*Agrobacterium* [*Pseudomonas*] *syringae*) [cf. ibid., 4, p. 488; 10, p. 323; 22, p. 70] than those similarly top-worked on Mazzard. In San Joaquin county under unfavourable conditions sweet cherry trees on Stockton Morello appear to be much more susceptible to this disease than are similar trees on Mazzard. Only a few cherry trees have been observed to be seriously injured by crown gall (*Agrobacterium* [*Bacterium*] *tumefaciens*) in California. In the Davis Station nurseries no differences were noted among rootstock species with regard to this disease. Crown rot (*Phytophthora* spp.) commonly affects trees on all three stocks in wet situations; it attacks trees on Mahaleb more often than those on Mazzard and much more rarely those on Stockton Morello.

It is feared that many Stockton Morellos started from suckers are infected with the virus or viruses causing rusty mottle [cf. ibid., 30, p. 278], even though they appear to be healthy; infected Bing trees on this stock clearly show characteristic bark blisters. Longstem Bing cherry seems to escape natural infection by buckskin disease [peach X-virus: ibid., 21, p. 83; 28, p. 408; 30, p. 170] regardless of the rootstock on which it is growing. In Solano County varieties top-worked high on the scaffold branches of Mahaleb saplings tend to escape infection. The disease has appeared in an aggravated form in sweet cherry on Stockton Morello. In Napa Valley where a different strain of the virus appears to be present the use of Mahaleb has not given encouraging results. *Coccomyces hiemalis* [cf. ibid., 30, p. 477], though present in California, has not defoliated nursery Mazzard seedlings there.

Chamberlain (G. C.). **Control of anthracnose of red Raspberries and downy mildew of Grapes in Ontario.**—Abs. in *Proc. Canad. phytopath. Soc.*, 18, p. 10, 1951.

When Taylor red raspberries in Ontario were sprayed against anthracnose (*Elsinoe veneta*) [*R.A.M.*, 10, p. 393; 29, p. 499; 30, pp. 15, 52] with a delayed dormant application of 1 in 10 lime-sulphur or 1 per cent. dinitro-*o*-cresylate alone and in combination with a summer application of fermate, Bordeaux mixture, or phygon, the delayed dormant spray alone gave good commercial control, and when followed by the summer spray gave excellent results.

Bordeaux plus orthex spreader-adhesive was the most effective treatment against vine downy mildew (*Plasmopara viticola*) [ibid., 24, p. 5; 30, pp. 11, 12] on the highly susceptible Fredonia, Agawan, and Delaware varieties in the Niagara Peninsula, the 5–5–100 formula comparing favourably with the Standard $7\frac{1}{2}$–10–100 concentration.

Keyworth (W. G.) & Bennett (Margery). **Verticillium wilt of the Strawberry.**—*J. hort. Sci.*, 26, 4, pp. 304–316, 2 pl., 1951.

Field observations, made in 1946–7 on *Verticillium* wilt of the strawberry in Britain [*R.A.M.*, 17, p. 689], especially in the Wisbech and King's Lynn districts where the disease is particularly prevalent, have shown that it causes the heaviest losses in the first year of growth and is, therefore, of greatest economic importance in runner beds, particularly in those of special stocks of the Huxley and Oberschlesien varieties with minimal virus infection. In experiments at the East Malling Research Station, using isolates from wilted strawberries, six of seven plants inoculated with *V. albo-atrum* [ibid., 30, p. 121] and five of seven inoculated with *V. dahliae* [loc. cit.] developed symptoms of wilt. Using isolates from hops [ibid., 18, p. 709], wilt symptoms appeared on all the 15 strawberry plants inoculated

with the 'fluctuating' strain of *V. albo-atrum*, 11 of 15 inoculated with the 'progressive' strain, and five of 15 inoculated with *V. dahliae*. Reisolations were made from diseased plants, none of the controls being affected. It was found from experiments on four different sites that runners taken from severely affected plantations may produce apparently normal plants, and the infectivity of the soil is suggested as the prime factor in determining wilt incidence. Some evidence has been obtained that this is affected by prior cropping with potatoes.

ASKEW (H. O.), CHITTENDEN (E. T.), & MONK (R. J.). **Die-back in Raspberries—a boron deficiency ailment.**—*J. hort. Sci.*, 26, 4, pp. 268–284, 4 pl., 1951.

Further studies at the Cawthron Institute, Nelson, New Zealand, on die-back in raspberries due to boron deficiency [*R.A.M.*, 30, p. 362] have shown that the degree of symptom expression, already described elsewhere [ibid., 30, p. 21], varies with seasonal conditions and the past history of the garden, the disease being most severe in those which are old-established and increasing with decrease of the available boron content in the soil. Borax at the rate of ½ oz. per bush gives satisfactory control, though care must be taken when applying it on newly established plants. Increased uptake of boron is shown to modify the mineral composition of leaves and fruit on treated plants.

HICKMAN (C. J.) & ENGLISH (MARY P.). **The susceptibility of Strawberry varieties to red core.**—*Trans. Brit. mycol. Soc.*, 34, 3, pp. 356–359, 1951.

Using the pot infection technique for *Phytophthora fragariae* recently described [*R.A.M.*, 31, p. 23], experiments at the University of Birmingham showed that rapid and reliable estimates may be made of varietal susceptibility in strawberries to red core disease. Comparison of the pathogenicity of a number of isolates of the fungus to three test varieties demonstrated at least three physiologic races [cf. ibid., 30, p. 525]. Race 1 (comprising two English isolates) was highly pathogenic to Huxley, very slightly to Perle de Prague, and non-pathogenic to Auchincruive Climax. Race 2 (four isolates from Scotland) was highly pathogenic to the first two and innocuous to the third. Race 3 (two isolates from Scotland) was highly pathogenic to Huxley and Climax and only very slightly to Perle de Prague.

SMITH (H. C.). **Red-core (Phytophthora fragariae) of Strawberries.**—*N.Z. J. Sci. Tech.*, Sect. A, 33, 1, pp. 49–55, 6 figs., 1951.

This is a report of studies at the Plant Diseases Division, Department of Scientific and Industrial Research, Auckland, on strawberry red core (*Phytophthora fragariae*) [*R.A.M.*, 30, pp. 20, 362, and preceding and next abstracts], which has been serious for some years in New Zealand, is generally widespread, and is a major factor in causing strawberries to be grown as an annual crop in the Auckland District. Symptoms of the disease and morphology of the fungus are the same as those given for red core in other countries [ibid., 30, pp. 174, 307]. Inoculations proved the pathogenicity of the fungus; all Madam Melba and 93 per cent. of Captain Cook plants developed the disease, while Chapman's seedling and Ettesburgh varieties appeared to show resistance [ibid., 30, p. 525]. Low incidence is associated with both a relatively low rainfall and light texture soil. Infected transplants take the disease to the fruiting beds, but it may not develop there, severity depending on the moisture content of the soil. Infection may be present in some apparently clean nurseries and detected only if plants are grown under wet soil conditions in the fruiting beds.

Control may be secured by growing only plants from red core free nurseries in clean ground, avoiding low-lying areas. Infected nurseries can be detected by inspecting them in the spring. A long rotation is necessary to prevent reinfection,

as the disease may occur even after the ground has grown non-susceptible crops for four years. Spread can be reduced by deep cultivation to improve drainage.

Stoddard (E. M.). **Control of Strawberry red stele by chemotherapy.**—*Phytopathology*, 41, 9, p. 858, 1951.

The results of a field trial at the Connecticut Agricultural Experiment Station with dithane D14 (1·5 per cent.), applied at the rate of 2,000 gals. per acre at the onset of flowering in early May, corroborated the conclusions already drawn from greenhouse tests as to the efficacy of the chemical in the control of strawberry red stele [*Phytophthora fragariae*: *R.A.M.*, 30, p. 619, and preceding abstracts].

Cheema (G. S.), Karmakar (D. V.), & Joshi (B. M.). **Investigations on the cold storage of Mangoes.**—*Indian J. agric. Sci.*, 20, 3, pp. 259–325, 5 pl. (1 col.), 6 graphs, 1950.

Studies on the cold storage of mango fruits [cf. *R.A.M.*, 23, p. 347] were carried out at Kirkee, India, as part of the Cold Storage Research Scheme and were originally published as a miscellaneous bulletin (No. 21) in 1939. Fruit of different varieties from Madras, Bihar, the United Provinces, and Bombay was used. Decay, in the form of stem end rot, lateral rot, 'brown patches', and 'watery rot', was associated with *Gloeosporium mangiferae* [cf. ibid., 18, p. 750; 26, p. 331], which was also present on the fruit in latent infections, the different types of rot developing only when there was a decrease in resistance to fungal growth at the different storage temperatures. This view was strengthened by repeated observations in the course of the experiments.

Neergaard (P.). **Retningslinierne ved afprøvning af fungicider.** [Alinements in the testing of fungicides.] —*Nord. Jordbr Forskn.*, *1949–50*, 3–4, pp. 212–232, 1 fig., 1 graph, 1951. [English summary.]

This is a survey of the various methods applicable to the testing of fungicides for seed disinfection and protection and the spraying and dusting of crops. Routine work at the Danish State Phytopathological Experiment Station is governed by the following principles. (1) The efficacy of test preparations is gauged by comparison with a standard fungicide, using a standard schedule of spraying or other treatments appropriate in a particular case. (2) Preparations are tested for efficiency under conditions conducive to heavy infection, whereas their profitability is usually assessed on crops exposed to normal risks. (3) On grounds of economy, a few concentrations at the most are tested—sometimes only one—but for seed disinfectants the number has lately been raised to five. (4) Both test and standard preparations are applied at dosages expected to result in moderately effective rather than absolute control, since there would otherwise be an insufficient basis for the appraisal of variations in efficacy between one compound and another. (5) Experiments are conducted simultaneously at several places, several trials without replications being preferred to one replicated test, especially for sprays and dusts.

Some possibilities for the standardization of fungicidal tests in the Scandinavian countries are envisaged, with special reference to the methods approved for routine assessment in the United States [*R.A.M.*, 26, p. 497; 28, p. 471, *et passim*] and Germany [ibid., 17, p. 51]. The author's experiments with bio-assay methods of slide germination and settling tower [ibid., 19, p. 665; 20, p. 27; 27, p. 435, *et passim*] are described. Problems concerning experimental material (chemicals, plants, and pathogens) and conditions (e.g., locality) and grading methods are discussed.

Goldsworthy (M. C.) & Gertler (S. I.). **Fungicidal and phytotoxic properties of 412 synthetic organic compounds.** – *Plant Dis. Reptr, Suppl.* 205, pp. 176–189, 1951. [Multilithed.]

Information has already been given concerning the fungicidal and phytotoxic effects of 506 synthetic organic compounds on the conidia of *Monilinia* [*Sclerotinia*] *fructicola* [*R.A.M.*, 31, p. 27], causing brown rot of peaches, and *Glomerella cingulata*, the agent of bitter rot of apples [ibid., 28, p. 469]. This paper gives the results of similar tests at the Plant Industry Station, Beltsville, Maryland, with 412 additional synthetic organic compounds, 24 of which were found to possess fungicidal properties but only five appeared promising enough to warrant further orchard tests. These are: N-ethyl-*p*-nitrobenzamide; the bis(*p*-nitrophenyl) ester of carbonic acid; 2,3,6,7-tetrachloro-5,6,7,8-tetrahydronaphthoquinone; 2,2′-thiobis (4-chlorophenol); and 2,3,5-trichloro-6-phenyl-*p*-quinone. Under orchard conditions the phenol compound also controlled apple scab [*Venturia inaequalis*], Brooks's spot [*Phoma pomi*], and sooty blotch [*Gloeodes pomigena*], but caused fruit russeting in some varieties; on peach it was effective for scab [*Fusicladium carpophilum*] and bacterial spot [*Xanthomonas pruni*] and completely non-toxic. The carbonic acid derivative was fungicidal and non-toxic under orchard conditions.

Naito (T.) & Tani (T.). **On the influence of phytohormones on germination of uredospores of rust fungi.**—*Tech. Bull. Kagawaken agric. Coll.* 2, pp. 167–177, 1951. [Japanese, with English summary.]

The uredospore germination of *Uromyces fabae* from broad bean [*R.A.M.*, 29, p. 6], *Puccinia graminis* from wheat [ibid., 29, p. 149], *U. appendiculatus* from bean [*Phaseolus vulgaris*: ibid., 28, p. 351], and *U. vignae* from cowpea was tested in aqueous solutions of the potassium salt of α-naphthalene acetic acid and the sodium salt of 2, 4-D [dichlorophenoxyacetic acid] at different concentrations. At dilutions of both at 1 in 100 to 200 the first three fungi did not germinate at all, whereas in the solutions diluted more than 2,000 times they germinated almost as well as in distilled water. The inhibitory action of these compounds on the elongation of the germ-tubes of *U. vignae* becomes negligible at dilutions of 20,000, while the corresponding level for *U. fabae*, *P. graminis*, and *U. appendiculatus* is over 200,000. The inhibitory action was enhanced by a rise of temperature.

Whitehouse (H. L. K.). **A survey of heterothallism in the Ustilaginales.**—*Trans. Brit. mycol. Soc.*, 34, 3, pp. 340–355, 1951.

A review of the literature (59 titles) reveals that the existence of heterothallism [cf. *R.A.M.*, 29, p. 224] has been established for some 30 species of Ustilaginales, in most of which it is of a simple plus and minus type. A critical study shows that claims for the existence of more complex types cannot be sustained. A negative result for a mating test need not imply that the two cultures investigated are sexually incompatible, as the test may be invalidated by genetic or environmental factors causing weak pathogenicity, preventing conjugation of spores on agar, or arresting the subsequent development of aerial mycelium. Claims for the existence of a second locus controlling heterothallism are due to genetic factors having such effects. The supposed multiple allelomorphs controlling heterothallism in *Ustilago longissima* [cf. ibid., 12, p. 88] are evidently factors affecting the appearance of the hyphae in culture or influencing pathogenicity, and not factors for heterothallism, while the three self-incompatible, mutually cross-compatible strains are easily explained by considering the third strain as a sterile dikaryon. It is concluded that in all species of Ustilaginales so far studied heterothallism is controlled by a single pair of allelomorphs.

Olive (L. S.). **Homothallism and heterothallism in Glomerella.**—*Trans. N.Y. Acad. Sci.*, Ser. II, 13, 6, pp. 238–242, 1951.

Information on the phenomena of homothallism and heterothallism in *Glomerella* is brought up to date and briefly discussed in the light of 20 important contributions to the literature [*R.A.M.*, 25, p. 407; 30, p. 375, *et passim*].

Chester (K. S.). **The measurement of plant disease losses.**—*Biologia*, 2, *1950–1951* (*Chron. bot.*, 12, 4–6), pp. 162–165, 1951.

In this condensed version, the full account of which has already been noticed [*R.A.M.*, 29, p. 521], the author emphasizes the need for accurate data on plant disease losses and suggests, as a means of remedying this deficiency, that (*a*) the measurement of disease intensity and the determination of the intensity-loss relationship should be a routine part of every formal disease study; (*b*) the measurement and interpretation of plant disease losses should be adopted as a major field of research by individual pathologists; (*c*) published data on the subject should be assembled as a start towards a relatively complete survey manual; (*d*) techniques and results should be compared at occasional conferences, and group tests made to determine and correct the subjective element in loss estimation; and (*e*) a course might be held for disease survey workers in which the principles involved in (*c*) and (*d*) would be organized to facilitate the rapid but accurate appraisal of crop losses. Since the author is attempting to organize the published data in this field he would welcome any references to disease intensity measurements or determinations of intensity-loss relationships, particularly from foreign literature.

Hubert (F. P.). **Common names of diseases of woody plants.**—*Plant Dis. Reptr, Suppl.* 207, pp. 205–235, 1951. [Multilithed.]

An alphabetical list is given of the common names of the fungal, bacterial, virus, and other diseases of woody plants of economic importance in the United States, Alaska, Hawaii, Panama Canal Zone, and Puerto Rico, followed by a list of the causal agents.

Keyworth (W. G.). **A Petri-dish moist chamber.**—*Trans. Brit. mycol. Soc.*, 34, 3, pp. 291–292, 1 pl., 1951.

A Petri dish moist chamber for encouraging fungi to grow from pieces of infected plant tissue may be improved by placing a strip of compressed paper pulp ($10\frac{1}{2}$ by $\frac{3}{8}$ by $\frac{1}{8}$ in.) on edge round the wall of the dish resting on the filter paper lining. The strips are cut from the type of sheet used in commercial filters. They absorb a large volume of water, swelling and extending considerably in the process, and keep the filter paper moist for at least three or four weeks. They may be used again after autoclaving and drying. In making up the chamber the filter paper and pulp strip are inserted dry and flooded with 18 to 20 ml. water, all of which is absorbed. When many specimens are to be examined they are separated by sterilized xylonite strips measuring $3\frac{1}{8}$ by $\frac{3}{8}$ in.

Pijper (A.) & Kistner (A.). **Slides and cover-glasses for dark-ground microscopy.**—*J. R. micr. Soc.*, Ser. III, 71, 2, pp. 176–180, 2 pl., 1951.

Studies at the Institute for Pathology, University of Pretoria, demonstrated that the condition of the slide and cover-glass largely determines the success of dark-ground microscopy. The best slides for this purpose consist of an ordinary, rather thin glass microscope slide to which a piece of mica of similar shape is cemented by means of Canada balsam. The double slide should be 1 to 1·2 mm. thick. When the balsam has hardened a thin layer of mica is split off with a sharp knife, leaving an untouched, scratch-free and dust-free surface. With good mica the splitting-off

process can be repeated several times. Only one make of cover-glass, of many local brands tested, was consistently free from inherent blemishes.

GROSSBARD (ERNA). **Antibiotics and microbial antagonism in plant pathology.**—*Endeavour*, 10, 39, pp. 145–150, 2 pl., 1951.

This is a condensed account of the outstanding results of the author's and other workers' studies on the action of antibiotics on plant pathogenic fungi and bacteria, their possible use as sources of new types of fungicides [*R.A.M.*, 30, p. 58], and their production and activity in the soil [ibid., 30, p. 139]. Control of plant pathogens, chiefly those causing root diseases, by the mechanism of microbial antagonism seems very promising. The effect of organic manuring is discussed.

GÄUMANN (E.), BRAUN (R.), & BAZZIGHER (G.). **Über induzierte Abwehrreaktionen bei Orchideen.** [On induced defence reactions in Orchids.]—*Phytopath. Z.*, 17, 1, pp. 36–62, 6 figs., 7 diags., 3 graphs, 1950.

The authors describe the method used at the Federal Technical Institute, Zürich, Switzerland, for testing the anti-fungal secretions of living orchid rhizomes. The fungistatic substance occurring in free-living rhizomes of *Orchis militaris*, of which the production probably represents a reaction to spontaneous infection by the mycorrhizal fungus *Rhizoctonia repens* [*R.A.M.*, 22, p. 171], was increased fourfold by the exposure of fair-sized rhizome fragments to massive invasion by this organism in agar cultures. The inhibitory effect of this defence reaction begins to be macroscopically perceptible after two days, but full efficiency is only attained after five. The defence reactions do not operate to any appreciable extent at soil temperatures below 15° C. and an optimum is reached at 27°. The fungistatic substance produced by the rhizomes of *O. militaris* is effective also against *Fusarium solani*.

RECKENDORFER (P.). **Die Bestimmung von Fluor in rauchgeschädigten Pflanzen.** [The determination of fluorine in smoke-damaged plants.]—*PflSch. Ber., Wien*, 6, 7–8, pp. 113–124, 1 fig., 1951. [English summary.]

Willard and Winter's method (*Industr. Engng Chem., Analyt. Ed.*, 5, p. 7, 1933) for the determination of the fluorine content of plants damaged by industrial fumes [*R.A.M.*, 27, p. 285] proved both expeditious and accurate in the writer's studies at the Federal Plant Protection Institute, Vienna.

LINDBERG (N. J.). **Fenylkvicksilveracetatets användning för konservering av våt slipmassa.** [The use of phenylmercuric acetate for the preservation of wet mechanical pulp.]—*Paperi ja Puu* (*Paper & Timber*), 33, 4, pp. 83–84, 1951.

Very promising results were obtained in 1950 in a Finnish groundwood pulp mill by the application to the bales of a 20 per cent. preservative solution of limantuho, a phenylmercuric acetate preparation [cf. *R.A.M.*, 30, p. 427], at a dosage of 30 gm. per ton. After five months' storage inside the mill under conditions favouring fungal invasion, the bales thus treated were perfectly sound, whereas the untreated were extensively decayed, the light brown discoloration being suggestive of *Lenzites* sp. The weight of the rotted material was reduced by 28 per cent. and it was practically useless for paper production.

MUSGRAVE (A. J.) & MITTON (R. G.). **A study of the mould growth on a catechol-tanned leather and of the associated changes in physical properties.**—*J. Soc. Leath. Tr. Chem.*, 34, pp. 324–342, 1 fig., 1950.

In studies at the British Leather Manufacturers' Research Association, Egham, Surrey, 144 samples of catechol-tanned leather, pre-conditioned for several days

at 70 per cent. relative humidity and 70° F., were treated with 0·25 per cent. *p*-nitrophenol or oil or were washed to remove water solubles, and then kept for periods up to six months at 24° or 30° C. and 100 per cent. humidity [*R.A.M.*, 30, p. 576]. All the 96 experimental pieces exposed for over five days to conditions favourable for mould growth were affected, and some fungi were identified. Species of *Penicillium* included *P. spiculisporum*, new to Britain, *P. frequentans* and *P. wortmanni*, new to the leather industry, and *P. rugulosum*. *Aspergillus terreus* and *A. repens* were found as well as members of the *A. niger* group and *Paecilomyces* sp. [cf. ibid., 27, p. 485]. Physical tests showed that mould growth caused little change in physical properties of the leather.

Basu (S. N.). **Significance of calcium in the fruiting of Chaetomium species, particularly Chaetomium globosum.**—*J. gen. Microbiol.*, 5, 2, pp. 231–238, 1 graph, 1951.

In studies at the Indian Jute Mills Association Research Institute, Calcutta, calcium (10 p.p.m. as calcium chloride) was shown to be necessary for perithecial production in *Chaetomium globosum*, *C. indicum* [*R.A.M.*, 30, p. 529], and three other *C.* spp. The calcium present in jute extract is responsible for its stimulatory effect on fruiting in *Chaetomium* [*R.A.M.*, 29, p. 474].

Schuphan (W.). **Eine kolorimetrische Schnellmethode (modifizierter Tryptophan-Schnelltest) zur Unterscheidung gesunder und viruskranker Kartoffeln. (Vorläufige Mitteilung.)** [A rapid colorimetric method (modified rapid tryptophane test) for the differentiation of healthy and virus-diseased Potatoes. (Preliminary note.)—*Z. PflKrankh.*, 57, 11–12, pp. 408–415, 4 graphs, 1950.

The fact that the tryptophane content of virus-diseased potato tubers is a great deal higher (119 per cent. in the author's investigations in Hamburg, Germany) than that of healthy ones led to the development of a rapid test, based on a quantitative xanthoproteic reaction, for the differentiation of healthy and infected material. H. Roth's test (*Angew. Chem.*, A, 52, pp. 149–151, 1939) was modified and simplified. Fresh potato pulp (5 gm.) is left to stand in 40 ml. of pure 25 per cent. nitric acid for 10 minutes and then heated for five minutes. After cooling with running water the liquid is made up to 50 ml. with more nitric acid and pressure filtered. The clear filtrate is gauged against a tryptophane standard in a microcolorimeter. By this means the presence in the tubers of A+X, leaf roll, Y, and X viruses can be reliably diagnosed within 15 to 30 minutes. The non-specificity of this expeditious and economical test is an advantage rather than otherwise, since the plant-breeder's aim is the production of absolutely healthy tubers for seed and the extirpation of any kind of diseased material.

Kozłowska (A[niela]). **Investigation of masked virus X in Potatoes by complement fixation test.**—*Bull. int. Acad. polon.* (*Cracovie*), Sér. BI, *1950*, 1–3, pp. 65–84, 1950.

In further studies on strains of potato virus X at the Jagiellonian University, Cracow [cf. *R.A.M.*, 30, p. 186], antisera for the complement fixation test were obtained from the sap of infected White Burley tobacco, *Datura stramonium*, cucumber, and vegetable marrow, and from [healthy] cucumber and phlox plants receiving a solution of ammonium molybdate [ibid., 27, p. 311]. The properties of the antisera obtained were compared with serum received from Rothamsted. Antigens were prepared from potato and tobacco leaves, tuber sprouts grown in the light and dark, and non-germinated tubers.

In the investigation of masked X strains in potato haulms and sprouts the sensitivity of the complement fixation test was eighty times greater than that of the

precipitin test, particularly when the antisera applied were specific for antivirus X. Antisera which lose their capacity for precipitation after two months are still able to prevent haemolysis for several months. By complement fixation the presence of the virus may be determined even in starch meristem, if centrifugation at 10,000 revolutions is employed for antigen production. The method permits the detection of masked strains in potatoes and tobacco leaves when neither precipitation nor inoculation of test plants gives positive results. When potato sap gave negative results in the fixation test, tobacco leaves inoculated with this sap gave a positive reaction.

The known methods used for the detection of virus X in potatoes may be arranged according to sensitivity as follows: (*a*) the precipitin method generally detects the virus in sprouts and haulms only when the sap produces external symptoms on tobacco leaves; (*b*) the complement fixation test gives positive results both when precipitation succeeds and when it fails for lack of sufficient virus; (*c*) the most sensitive indicator is the fixation test used not only on potatoes but on tobacco leaves sap-inoculated from them. Inoculation of test plants remains the most sensitive indicator method for strongly virulent strains of virus X.

Murayama (D.), Yamada (M.), & Matsumiya (H.). **Detection of X virus in apparently healthy Potatoes.**—*Agric. & Hort., Tokyo*, 26, 2, p. 269, 1951. [Japanese.]

The presence of potato virus X in the apparently healthy potato tubers collected in the fields of Hokkaido, Japan, was detected by serological-diagnostic procedures [see preceding abstract], i.e., the precipitin, complement-fixation, and slide methods, as well as by inoculation tests on tomato and *Datura stramonium*. Danshaku and Beniaka, the most widely-grown varieties in Japan, harboured 94 to 98 per cent. infection, whereas recently developed varieties, such as Norin No. 1 and No. 2, were considerably less infected (50 to 83 per cent.). The results of precipitin and inoculation tests coincided in 84·4 per cent. of the 375 tests. The precipitin reaction is more convenient than inoculation for the end in view, especially as the time required for the former operation is only one day as against a week to a fortnight for the latter.

Gäumann (E.). **Über den Einfluss der Bodentemperatur auf die Symptomausprägung bei der Blattrollkrankheit der Kartoffeln.** [On the influence of soil temperature on symptom expression in Potato leaf roll disease.]—*Phytopath. Z.*, 16, 4, pp. 479–482, 1950.

In experiments in 1948 under controlled conditions at the Federal Technical Institute, Zürich, soil temperatures within the range of 9° to 35° C. exerted no influence on the expression of leaf roll virus symptoms in Craigs Defiance potato plants raised from inoculated tubers [cf. *R.A.M.*, 29, p. 168]. The tubers from the infected plants produced another diseased crop. In the spring of 1949 virus-free Eigenheimer tubers were planted in soil where the preceding year's crop had been infected with leaf roll to test the hypothesis of a causal connexion between that disease and spraing, the etiology of which is still obscure [ibid., 13, p. 650 *et passim*]. However, no symptoms of spraing appeared in the tubers on lifting in the following autumn.

Boncampagni (T.), Scotti (T.), & Lorenzini (T.). **Prove di lotta contro il Synchytrium endobioticum con l'impiego di razze di Patate resistenti.** [Experiments on the control of *Synchytrium endobioticum* using resistant Potato varieties.]—*Notiz. Mal. Piante, 1951*, 14, pp. 64–87, 1951. [English summary, p. 103.]

Synchytrium endobioticum [C.M.I. map No. 1] was first observed on potatoes in Italy during 1941 on plots in the Chiavenna mountain region of the Menarola

district. Investigations by the Provincial Agricultural Inspectorate, Sondrio, revealed that the disease probably first appeared there in 1936 at 1,200 m. above sea level. New foci developed in 1938 in the S. Giacomo Filippo district at 950 m. and almost simultaneously at Piuro, Isolato, Campodolcino, Verceia, and Novate Mezzola. A survey in September, 1947, revealed that the disease was widespread in almost all the potato-growing localities of Chiavenna above 800 to 900 m. In some areas where it had been present for some time the pathogen seemed to be less virulent, but in many plots severe losses were sustained. Weather conditions did not favour disease extension in 1948 and 1949. In 1950 when weather conditions were more favourable for infection, it was of no great virulence. Varietal experiments were carried out at various places in the Spluga, Bregaglia, and Chiavenna valleys. No trace of the disease was observed on any of the introduced varieties Voran, Alpha [*R.A.M.*, 30, p. 70], Arran Banner [ibid., 30, p. 242], or Majestic. Voran and Alpha were also sufficiently and moderately resistant, respectively, to scab [*Actinomyces scabies*: ibid., 29, p. 639]. Arran Banner showed average resistance to scab and [unspecified] 'cancrena'.

De Carvalho (T.). **O mildio de Batateira (Phytophthora infestans, de Bary).** [Potato mildew (*Phytophthora infestans* de Bary).]—*Gaz. Agric., Moçambique*, 2, 13, pp. 123–130, 9 figs., 1950.

During January and February, 1950, potato blight (*Phytophthora infestans*) was observed for the first time in Mozambique [C.M.I. map No. 109] on the Bintje and Arran Banner varieties raised from 'seed' of Dutch origin. The former variety was highly susceptible and the resistance of the latter was confined to the foliage, the tubers decaying in the soil as soon as they were formed. Information is presented on various aspects of the disease.

Annual Report of the Director of the Meteorological Office presented by the Meteorological Committee to the Secretary of State for Air for the year April 1, 1950 to March 31, 1951.—53 pp., 1 map, London, H.M. Stationery Office, 1951. 1*s.* 6*d.* net.

In the section on Agricultural Meteorology (pp. 24–25) of this report it is stated that the Meteorological Office, acting in co-operation with the Ministry of Agriculture Plant Pathology Laboratory, arranged a system of potato blight [*Phytophthora infestans*] warnings [cf. *R.A.M.*, 27, p. 88; 30, p. 529] in Britain during the summer of 1950, using the network of synoptic reporting stations, which advised the pathologists when periods of warm, humid weather occurred. In a year when infection was early and widespread, reaching epidemic proportions in some areas, the warning system worked very well; much valuable produce was saved and a considerable amount of information obtained on the spread of the disease and its dependence on weather conditions [cf. ibid., 31, p. 30].

Howatt (J. L.) & Hodgson (W. A.). **Testing Potatoes for resistance to late blight Phytophthora infestans (Mont.) De Bary.** Abs. in *Proc. Canad. phytopath. Soc.*, 18, p. 11, 1951.

In work carried out in New Brunswick on the production of potato varieties resistant to *Phytophthora infestans* [ibid., 29, p. 143 and next abstracts] *Solanum demissum* was hybridized with standard potato varieties and then back-crossed with *S. tuberosum*. All seedlings were tested for resistance by inoculating whole plants in the greenhouse with a spore suspension, detached leaves of all surviving plants then being tested under controlled conditions. Of 91,000 seedlings so tested, ranging from completely immune to susceptible, a number are thought to be of some commercial value No evidence has so far been obtained that *P. infestans* increases

in virulence after serial passage from a susceptible plant through a series of increasingly resistant plants, or that biologic races of the fungus exist locally. Investigation of the causes of wide discrepancies in reaction under controlled conditions appear to be necessary.

KAMMERMANN (N.). **Undersökningar rörande Potatisbladmöglet, Phytophthora infestans (Mont.) de By. I. Metodologisk undersökning angående prövningen av Potatisblastens resistens mot bladmöglet. II. Sambandet mellan Potatisbladsaftens peroxidasaktivitet och Phytophthora resistensen.** [Studies relating to Potato blight, *Phytophthora infestans* (Mont.) de Bary. I. Methodological study concerning the evaluation of Potato tops for resistance to blight. II. The connexion between the peroxidase activity of Potato leaf sap and resistance to *Phytophthora.*]—*Medd. Växtskyddsanst., Stockh.*, 57, 41 pp., 2 figs., 1 graph, 1950; 58, 32 pp., 1 graph, 1951. [German summaries.]

The purpose of this investigation, which was begun in the autumn of 1948 at the Plant Protection Institute, Stockholm, was to compare various procedures described in the literature for the evaluation of resistance in potato tops to blight (*Phytophthora infestans*) [*R.A.M.*, 29, p. 638 and preceding and next abstracts] and on that basis to evolve a method, as simple and accurate as possible, adapted for application to large stocks of breeding material. The two lines of approach followed in Sweden are towards the production of immune varieties from crosses between *Solanum demissum* and *S. tuberosum* [ibid., 27, p. 35; 30, p. 625, *et passim*] and the development of resistance (as distinct from immunity) by crossing within the latter species.

The first experiment in relation to the degree of resistance [ibid., 16, p. 553; 19, p. 300; 26, p. 559] comprised 40 plants of 10 varieties which had formed 9 to 12 leaves at the time of atomization with a very dilute zoospore suspension of the fungus. Neither the number of primary lesions and their average size three days after infection nor the incubation period proved to be reliable criteria for the evaluation of resistance under the prevailing conditions, but certain clear-cut differences were observed between susceptible and resistant varieties in respect of mycelial development on the leaves. Using a scale in which 0 = no mycelium and 4 = very abundant, Ackersegen and Alpha were assigned the number 1, Voran and President 1 to 2, President Wohltmann 2, Majestic and King George V 2 to 3, Up-to-date 3, and Irish Cobbler and Early Puritan 4. In subsequent experiments with 37 varieties the application of a dense zoospore suspension to the leaves facilitated the evaluation of resistance and enhanced the accuracy of the method. Almost invariably fructification of the pathogen began later on relatively resistant than on susceptible varieties, which could usually be excluded at the first grading two days after the onset of fructification. The time of the second grading depends on the prevailing cultural conditions. For instance, the diminished resistance of plants grown in short daylight is expressed by a brief period (barely three days) of fructification and the rapid progress of infection. In such extreme cases a misleading impression of varietal reaction is conveyed after the lapse of a 24-hour interval, the abundance of mycelium sometimes being so great, even on the less susceptible varieties, as to preclude a determination of the degree of resistance. Supplementary observations at the time of the first grading are indicated in such cases.

In the second experiment attention was directed to the size and colour of the necroses after the onset of fructification and to the spread of the mycelium in the leaf [ibid., 22, p. 108; 28, p. 414; 29, p. 226]. The results were in general agreement with the known facts that the necroses on resistant varieties are larger and darker and mycelial spread slower than on susceptible ones. The extent of mycelial production is a more dependable index of reaction than the size and colour of the necroses or the rate of mycelial spread, and the use of this criterion resulted in

satisfactory correspondence at the second grading between the resistance values of 25 seedlings and those of the respective parent varieties.

In collaboration with Dr. O. Tedin, of the Swedish Plant Breeding Institute, Svalöv, seedlings from several new crosses were tested and selected in the spring of 1949, the evaluation of resistance being based on the outcome of inoculation of three leaves on each seedling. Considerable differences in the amount of mycelial production were noted among the progeny (40 plants) of Ostbote × Sandnudel. Of 32 seedlings arising from hybrids having *S. demissum* in their ancestry, only four were ultimately selected as having the maximum degree of resistance.

Preliminary experiments to assess the grade of resistance were performed on 10 commercial varieties and *S. demissum*, using detached leaves inoculated in Petri dishes and maintained at 20° C. in a saturated atmosphere. At the same time the plants from which the leaves were taken were inoculated in the greenhouse. At the close of the incubation period striking differences were apparent, the greater resistance of the whole plants being only in part attributable to the warmer and drier conditions prevailing in the greenhouse. The primary necrotic lesions were smaller on the detached leaves than on the plants, while the growth of the mycelium was more rapid and fructification more abundant on the former. Leaves on which the fungus had been unable to form aerial mycelium were graded as resistant unless the rate of spread in the tissues was exceptionally rapid. Nine of the varieties and *S. demissum* reacted according to expectation, but the reaction of Wekaragis was anomalous and would have placed it in the resistant group, to which it can scarcely be assigned.

Further experiments were undertaken with a view to the release of blight epiphytotics in the field, where the final verdict will be reached on the performance of varieties showing relative resistance in the greenhouse. A simple method of establishing a number of sites of primary infection consists in tying paper bags round the plants to serve as 'moist chambers', supplemented if necessary by temporary artificial irrigation of the area.

The unpublished results of a microscopic examination demonstrated that the immunity of *S. demissum* seedlings does not reside in the unsuitability of the leaf tissue as a substratum for the pathogen. It is hardly likely, moreover, that the variable nutritive value of the host tissue is the sole factor responsible for the divergent reactions of potato varieties to *P. infestans*.

Following a summary of Gretschuschnikoff's studies on the connexion between the peroxidase activity of potato varieties and their resistance to blight [ibid., 19, p. 300], a tabulated account is given of six tests, using the colorimetric method of Zirm *et al.* (*Biochem. Z.*, 245, 4–6, 1932), on some 50 varieties to confirm the validity of his conclusions. The results indicated some degree of correspondence inasmuch as varieties with high peroxidase activity, such as Jubel, Ackersegen, Libertas, Sebago, and Arran Consul, were generally more resistant than the less active, e.g., Up-to-Date, Goldperle, and Early Puritan. However, the correlation is definitely not of such a nature as to be maintained under all conditions, as was demonstrated by the existence of exceptions to the rule and the variable results of tests under suboptimal light. The peroxidase activity of immune *S. demissum* plants was by no means high, while that of the immune W-varieties [*R.A.M.*, 30, p. 625] and *S. demissum* hybrids varied in degree. In this respect, therefore, there is an important difference between *S. demissum* and the commercial varieties of *S. tuberosum*. Other observations, e.g., those of Lehmann [ibid., 17, p. 765], denote that the resistance of the commercial varieties and the immunity of *S. demissum* hybrids are governed by different factors, though the 'mechanism of resistance' is apparently the same in both species.

It is concluded that the peroxidase activity test, while not applicable to *S. demissum* hybrids, affords a rough guide to the reaction of commercial varieties.

The accuracy of the method could no doubt be improved by some simple modifications, and a rapid test on the lines devised by Brücher (*Physiol. Plant.*, 1, 4, pp. 343–358, 1948) seems to be well adapted to large-scale use. The dependability of the peroxidase activity test, however, is far inferior to that of the biological procedure.

Lihnell (D.). **Prövning av Potatisblastens resistens mot bladmögel.** [Testing Potato tops for resistance to blight.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1951*, 2–3, pp. 29–33, 2 figs., 1951.

Kammermann's methods and results in the evaluation of resistance to blight [*Phytophthora infestans*: see preceding and next abstracts] are briefly summarized with explanatory observations.

Andrén (F.). **Besprutningsförsök mot Potatisbladmögel 1950.** [Spraying experiments against Potato blight 1950.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1951*, 2–3, pp. 33–36, 1 fig., 1951.

In experiments for the control of potato blight [*Phytophthora infestans*] on the Up-to-Date variety in two localities of Sweden [see preceding abstracts] on the lines previously described [*R.A.M.*, 30, p. 187], spraying proved somewhat more effective, as usual, than dusting. The highest yield of 35,450 kg. per ha. at Nyckelby, where applications were made on 31st July and on 18th August, was obtained from the plots treated with cuproil (a copper-oil emulsion) at 0·5 per cent. The yields resulting from the next best treatment, with SR 406 [see above, p. 67] (a wholly organic preparation), and of the untreated plots were 31,930 and 25,160 kg. per ha., respectively. SR 406 was also very effective against storage rot but failed to eliminate infection from the tops. Bordeaux mixture (2 per cent.) reduced the incidence of both phases of the disease to a minimum.

At Åkarp (Scania) 2 per cent. Bordeaux, applied on 5th and 27th July, gave a yield of 40,700 kg. per ha., followed by 0·8 per cent. carsane with 40,660, as compared with 28,360 for the untreated plots. There was little difference between the several preparations in toxicity to *P. infestans* until 8th August, after which date Bordeaux mixture was the most efficacious. However, by 29th September all the tops were dead, indicating the need for a third application in southern districts, where infection frequently breaks out earlier than in central Sweden.

Van Hoof (H. A.). **Notes on the weathering of copper sprays in connection with the control of Phytophthora infestans de Bary.**—*Contr. gen. agric. Res. Sta., Bogor*, 113, 12 pp., 1 fig., 1 graph, 1950. [Indonesian summary.]

Spraying tests for the control of potato blight (*Phytophthora infestans*) in Indonesia [*R.A.M.*, 30, p. 243] were used for determinations of the adhesive properties of copper in Bordeaux mixture and in the increasingly popular copper oxychloride [cf. ibid., 30, p. 587]. The Bevelander variety following *Crotalaria usaramoensis* in an experimental garden at an altitude of 1,140 m. was used. The crop, planted on 14th November, 1949, was sprayed on 12th and 27th December and 21st January, 1950, with (*a*) 1·5 per cent. Bordeaux mixture; (*b*) 0·75 per cent. copper oxychloride in the form of koneprox [ibid., 30, p. 631], containing 50 per cent. copper (N. V. Koninklijke Nederlandse Zoutindustrie, Hengelo, Holland), in both (*a*) and (*b*) with and without 0·2 per cent. teepol spreader [cf. ibid., 30, p. 366] (sodium salt of an alkyl sulphate, Shell Chemicals Ltd.); and (*c*) copper oxide as copper suboxide, containing 50 per cent. copper (Shell Chemicals Ltd.). Of 53 leaves picked at random daily for a fortnight after spraying, 50 were used to determine the copper content by iodometric and colorimetric methods and three for copper prints. In the print test the dry sprayed leaf was placed between two

filter papers moistened with rubeanic acid. The amount of residual copper was indicated by the degree of prominence of the imprint of the leaf on the filter paper.

Bordeaux mixture was found to be more resistant to weathering than copper oxychloride and its distribution over the leaves was much more uniform. The copper residue from both preparations was reduced by the presence of a spreader, which also diminished the initial adhesiveness of Bordeaux mixture. The conclusions of Magie and Horsfall (abs. in *Phytopathology*, 26, pp. 100–101, 1936) and Horsfall [*R.A.M.*, 25, p. 128] that the fungicide weathered off approximately according to the amount of rainfall could not be substantiated by the author's results, which pointed rather to the importance of time in this connexion, while the heavy local dew formation may well be a contributory factor [cf. ibid., 17, p. 539]. In the present series of experiments the wash-off after five to six days was very slight and the limit was practically reached, the copper content of the leaf then being negligible. There was no significant difference in adhesiveness between Bordeaux and copper oxychloride. The yields (in quintals per ha.) from the plots treated with Bordeaux mixture alone and with teepol, copper oxychloride alone and with teepol, and copper suboxide were 82·3, 84·5, 81, 77, and 86·1, respectively.

In another test on Bevelander following potato, involving four applications of Bordeaux mixture, copper oxychloride (Shell), copper oxide (aacodule) [ibid., 30, p. 631], and an organic mercury compound known as AA922 (Landbouwbureau M. Wiersum, Groningen), the respective yields were 57·7, 56·5, 56·5, and 49·6 quint., as compared with 38·8 from the untreated plots. In an earlier experiment (spring of 1949) on the same variety following grass the yields from the plots treated with Bordeaux, aacodule, copper oxychloride as koperkalk Wieko (containing 50 per cent. copper), and two organic mercurials, AA481 and AA489 (the last three from M. Wiersum), were 39·7, 36·5, 37·4, 26, and 27·1 quint. per ha., respectively, compared with 25·5 from the untreated. In a test on Eigenheimer following cabbage at Lembang (1,250 m.) in the winter of 1949 to 1950, a Bordeaux-treated plot yielded 89 quint. per ha., the plots sprayed with 0·8 and 0·4 per cent. copper oxychloride (Shell) 72·4 and 81, and those treated with the same compound in the form of cuprokylt (50 per cent. copper: Metallo Chemical Refining Co., Ltd., London), at the same strengths 70 and 77·8 quint. per ha., respectively.

Wenzl (H.). **Untersuchungen über die Colletotrichum-Welke-Krankheit der Kartoffel. I. Schadensbedeutung, Symptome und Krankheitsablauf. II. Die Hydratur welkekranker Knollen. III. Pflanzgut und Futterwert welkekranker Kartoffeln.** [Studies on the *Colletotrichum* wilt disease of the Potato. I. Extent of the damage, symptoms, and course of the disease. II. The hydration of wilt-diseased tubers. III. Value of wilt-diseased Potatoes as seed and fodder.]—*PflSch.Ber., Wien*, 5, 7–8, pp. 305–349, 9 figs., 1 graph, 1950; 6, 3–4, pp. 33–57; 7–8, pp. 97–112, 2 graphs, 1951. [English summary.]

Few potato diseases are as destructive in hot, dry summers in the low-rainfall areas of eastern Austria and the adjacent parts of Czechoslovakia and Hungary as the wilt caused by *Colletotrichum atramentarium* [C.M.I. map No. 190; *R.A.M.*, 13, p. 592]. Recent observations have shown that infection originates in the roots and gradually proceeds to the stolons and shoot bases, which become brittle and die. After the death of the roots the tubers and stems serve as water reservoirs. The symptoms of wilt in the above-mentioned countries agree in all respects with those of black dot or 'dartrose' [ibid., 5, p. 447; 22, p. 402; 29, p. 228, *et passim*]. No connexion could be traced between the appearance of *C. atramentarium* spots on the tubers and wilting. The lesions are, in fact, more numerous on normally turgescent tubers than on the flaccid ones affected by wilt in the same field.

The rapid loss of weight of artificially wilted tubers in storage starts before the onset of [unspecified] dry and soft rots. The abnormally low starch content of tubers of apparently normal turgescence from wilted plants arises from the premature severance of the stolons. The softening associated with *C. atramentarium* wilt is accompanied by a rise in the concentration of the substances dissolved in the cell sap (almost exclusively mono- and disaccharides).

A clear-cut correlation was observed between the incidence of wilt in the dry, hot regions of eastern Austria and that of spindle sprouting ('Fadenkeimigkeit'), known in France as 'filosité' [ibid., 4, p. 433]. Tubers from infected stands sprout, if at all, either prematurely or tardily. They may be safely used as fodder but should be consumed in good time owing to their tendency to decay. Stringent selection should be practised before material from wilted stands is planted, discarding any tubers with weak, spindling, or no sprouts.

Yoshii (H.). **On the germination of the conidia of Piricularia oryzae in the water drops on the leaves of Rice seedlings treated with cephalothecin.**—*Ann. phytopath. Soc. Japan*, 15, 1, pp. 13–16, 1950. [Japanese, with English summary.]

Conidial germination of the rice blast pathogen (*Piricularia oryzae*) [*R.A.M.*, 30, p. 539] in water drops on the leaves of seedlings previously treated with cephalothecin, extracted from culture filtrates of *Cephalothecium* sp. [ibid., 30, p. 190], either by three days' soaking of the seeds or by 12 hours' immersion of the roots in the antibiotic, was inhibited in proportion to the concentration of the solution. A tendency to reduction in the percentage of appressoria formed was also observed. These processes may be of primary importance in the considerable lowering of the number of lesions developing on inoculated leaves of treated plants as compared with untreated. Moreover, the fact that the actual number of lesions was fewer than the calculated number of penetrating conidia per 1 cm. of leaf length suggests that the treatment may also influence the spread of the pathogen after its entry into the host.

Malaguti (G.), Calvo (J. S. S.), & Ravanello (G.). **Condiciones que favorecieron el desarrollo del brusone (Piricularia oryzae Cav.), en los arrozales del Estado Portuguesa en el año 1950.** [Conditions that favoured the development of 'brusone' (*Piricularia oryzae* Cav.) in the Rice fields of the State of Portuguesa in the year 1950.]—*Agron. trop., Maracay*, 1, 1, pp. 29–49, 4 figs., 1 diag., 1951. [English summary.]

An epiphytotic of rice blast (*Piricularia oryzae*) [C.M.I. map No. 51] in the State of Portuguesa, Venezuela [*R.A.M.*, 30, p. 487], in July, 1950, was promoted by (1) a prevailing atmospheric temperature range of 24° to 30° C., (2) a relative humidity of 92 per cent. for periods of 16 to 24 hours, and (3) a soil temperature of about 20° [cf. ibid., 13, p. 265; 30, p. 539]. The susceptibility of the plants was further enhanced by their cultivation in sandy, well-drained soils with a high evaporation rate. The most deleterious cultural factor was the use of ammonium sulphophosphate at 150 to 200 kg. per ha. This treatment resulted in a disturbance of the physiological equilibrium of the plants and adverse changes in their anatomical structure, which were reflected in reduced resistance [cf. ibid., 17, p. 767; 30, p. 626]. The total loss from the outbreak over an area of 2,000 ha. in the zone of Ospino was computed at 704,000 kg.

Control measures under the dry rice cultural conditions of the region should include cultivation on heavier soils with a good capacity for moisture retention, the choice of fertilizers adapted to the particular type of soil, and seed disinfection.

Malaguti (G.). **Mancha de la hoja envainadora del Arroz causada por Rhizoctonia solani.** [Sheath spot disease of Rice caused by *Rhizoctonia solani*.]—*Agron. trop., Maracay*, 1, 1, pp. 71–75, 2 figs., 1951. [English summary.]

The lesions formed on rice leaf sheaths in the State of Portuguesa, Venezuela, by *Rhizoctonia* [*Corticium*] *sasakii* [*R.A.M.*, 26, p. 415], which the author considers to fall in the *R.* [*C.*] *solani* group [ibid., 30, p. 487], are pointed, elongated, up to 4·3 cm. in length and half as wide, cream or grey to yellowish with well-defined, chestnut-coloured margins. They develop in the basal region (up to a height of 8 to 15 cm. above soil-level) from the flowering period to maturity. The necrotic tissues contain a very slender, chestnut- coloured mycelium, giving rise to sclerotia which gradually turn from white to chestnut and readily fall to the ground. In culture on potato dextrose agar the average diameter of these organs is 2·2 mm., with a maximum of 4 or 5 mm. They developed after 13 to 17 days on diseased stems in a moist chamber. Inoculation experiments with the fungus on the leaf sheaths of adult rice plants and on tomato and eggplant seedlings resulted in the formation of typical spots, while bean [*Phaseolus vulgaris*] seeds sown in inoculated soil produced seedlings with collar rot. Hitherto the economic importance of the disease in Venezuela has been negligible.

Campacci (C. A.). **O 'carvão verde' do Arroz.** [The green smut of Rice.]—*Biológico*, 17, 4, pp. 72–74, 1 fig., 1951.

First observed in São Paulo, Brazil, in 1946, 'false' or 'green' smut of rice (*Ustilaginoidea virens*) [*R.A.M.*, 27, p. 450] seems to be continually extending its range in the State. The varieties affected are Pratão, Amarelão, 4-month, Catetinho, Rabo de Carneiro, Ferrão Preto, Pindorama, Pérola, Dourado Agulha, Catetão, Jaguarí, and Iguape Agulha. Pratão was also attacked in Minas Gerais. Inoculation experiments have so far given negative results and attempts at control proved unavailing.

Ashplant (H.). **Plantation research in Ceylon. Progress of Oidium defence experiments.**—*India Rubb. J.*, 120, 16, pp. 625–626, 1 fig., 1951.

This is a review, based on H. E. Young's report in the Combined Circulars of the Rubber Research Scheme for 1949, of recent developments in the control of *Hevea* rubber mildew (*Oidium*) [*heveae*] in Ceylon [*R.A.M.*, 30, p. 541] through the cultivation of the resistant clone LCB 870. The principal drawback to the large-scale propagation of this clone is its poor yielding capacity, which may be remedied, however, by top-budding it on to prolific but susceptible clones; experiments along these lines have resulted in the rapid development of exceptionally vigorous crowns.

Cheremisinov (N. A.). Мичуринское учение—основа мероприятий по борьбе с болезнями Кок-Сагиза. [Michurin teaching—a basis for control measures for the diseases of Kok-Saghyz.]—Природа [*Nature*], *1951*, 6, pp. 30–38, 1951.

From 1947 to 1949 field surveys and experiments were carried out at the Kursk Scientific Research Station to find possible control measures for the diseases threatening kok-saghyz [*Taraxacum kok-saghyz*: see next abstract] plantations in the U.S.S.R. By limiting the cultivation period of the crop to one year, rust [*Puccinia taraxaci*: *R.A.M.*, 31, p. 31], powdery mildew [*Sphaerotheca fuliginea* f. *kok-saghyz*: loc. cit.], root rots and vascular diseases [ibid., 20, p. 423], such as *Rhizoctonia* and white mould (*Sclerotinina libertiana*), were reduced considerably. Hybridization and selection of healthy disease-resistant plants for seed production are strongly recommended. Seeds of greater absolute weight give a more vigorous, earlier, and more disease-resistant young growth; plants grown from large, high-quality seeds showed higher resistance to [unspecified] tracheomycosis

and *P. taraxaci*, while those grown from small seeds were two to five times more susceptible to the former and very susceptible to the latter. The use of nitrogenous fertilizers during the early phases of development and the application of potassium and phosphorus fertilizers during and preceding the flowering period increased the disease resistance. In these experiments rust, root rot, and wilting in the check plants were 64·9, 10·6, and 6·9 per cent., respectively. Application of 60 gm. of nitrogen and 60 gm. of potassium per nidus reduced infection to 52·5, 7·1, 3·9 per cent., respectively; while an application of 60 gm. of phosphorus and 60 gm. of potassium reduced the infections to 40·1, 5·8, and 4·8 per cent., respectively. Nitrogen-phosphorus fertilizer containing no potassium increased infection considerably. Susceptibility of the young kok-saghyz growth and the infection of the plantations with root rot diseases were halved when 1 to 1·5 gm. of superphosphate per nidus was applied during seed-sowing. Root diseases such as white mould and red mould (*Rhizoctonia*) can be avoided by deep ploughing not less than 25 to 27 cm. deep. After three to four growth periods the field should not be ploughed more than 20 cm. deep lest the sclerotia should be brought to the surface again. Frequent deep cultivation helps in increasing disease resistance. Crop rotation is strongly advised, but kok-saghyz should not be planted where previous crops of sunflower, carrot, or beet have been infected with *Sclerotinia* or *Rhizoctonia*; such fields should be fallowed for a year. All plant litter in the field should be destroyed.

Cheremisinov (N. A.). Сохранить естественые заросли Кок-Сагиза. [Preservation of natural growths of Kok-Saghyz.]—Природа [*Nature*], *1951*, 4, pp. 45–46, 1951.

From the observations made during the summer of 1950 in the areas where kok-saghyz (*Taraxacum kok-saghyz*) is grown in the U.S.S.R., in addition to the fungus diseases already mentioned elsewhere [*R.A.M.*, 15, p. 740; 20, p. 423; 25, p. 329; and preceding abstract], the following were found to attack the crop readily in its natural state: *Pleospora kok-saghyz*, *Septoria kok-saghyz*, *Alternaria tenuis*, *Phoma kok-saghyz*, and unspecified fungi causing root rot [loc. cit.]. Infection in most cases was heavier on wild plants than in plantations and disease often spread from the former, the seeds of which are used in plantations, to the latter.

Keyworth (W. G.). **Split leaf blotch disease of the Hop (Humulus lupulus).**—*J. hort. Sci.*, 26, 3, pp. 163–168, 2 pl., 1951.

In further studies on split leaf blotch disease of hops [*R.A.M.*, 28, p. 308] at East Malling Research Station since 1946, great variation was observed in the incidence and severity of the symptoms [ibid., 27, p. 43] in different fields. Fuggle plants known to be affected with nettlehead disease usually showed symptoms of split leaf blotch also, even when the typical nettlehead symptoms were masked. Experimental work, however, with plants entirely free from nettlehead, showed that split leaf blotch could occur independently.

Further inarch grafting experiments confirmed that the more severe symptoms of split leaf blotch are graft-transmissible [loc. cit.] and presumed to be of virus origin. Evidence on the transmissibility of mild symptoms (occasional leaf blotches) was inconclusive, as they were observed initially in some of the indicator and control plants. Since none of the latter developed severe symptoms the mild may result from a different cause.

Salmon (E. S.). **Thirty-second report on the trial of new varieties of Hops, 1948. Thirty-third report on the trial of new varieties of Hops, 1949.**—*J. Inst. Brew.*, N.S., 47, 1, pp. 6–16, 1950; 48, 1, pp. 14–20, 1951.

Both these reports of trials at Wye College, Kent [cf. *R.A.M.*, 28, p. 241], contain information relating to the hop varieties OR55 and OJ47 (Keyworth's Midseason

and Keyworth's Early), which are moderately resistant to wilt (*Verticillium albo-atrum*) [ibid., 29, p. 120]. During the winter of 1948–9 the Hops Marketing Board Propagation Committee allotted to growers 17,950 sets of the former and 2,000 of the latter variety, the corresponding figures for 1949–50 being 111,350 and 10,710, respectively. Over 50 growers have now planted areas where the cultivation of Fuggle and other commercial varieties had become impracticable through soil infestation by the fungus. Another new wilt-resistant variety, OT48, has given satisfactory results in brewing trials.

Meffert (Maria E.). **Ein Beitrag zur Biologie und Morphologie der Erreger der parasitären Blattdürre des Mohns.** [A contribution to the biology and morphology of the agents of parasitic leaf-withering of the Poppy.]—*Z. Parasitenk.* 14, 5, pp. 442–498, 16 figs., 3 graphs, 1950.

This is an extensively amplified version of the author's studies in Germany on the opium poppy leaf blight (previously attributed to *Pleospora calvescens*), a preliminary note on which has already appeared [*R.A.M.*, 29, p. 535]. The taxonomy of the fungus is discussed at length. As *P. calvescens* is found only on Chenopodiaceae and has hairy perithecia the poppy fungus is considered to be *P. papaveracea* [ibid., 10, p. 206], which is confined to the genus *Papaver* and has naked perithecia. An expanded diagnosis is given and the synonyms *Pleospora pellita* and *Pyrenophora pellita* cited. Its imperfect states are *Helminthosporium papaveris* and *Dendryphium* [*Dendryphion*] *penicillatum*. The perfect state of *D. penicillatum* var. *sclerotiale* n.var. [described in German only], the agent of an identical poppy disease, is not yet known. The new variety is distinguishable from *H. papaveris* and *D. penicillatum* by the production of microsclerotia both in culture and on infected plants, by its smaller conidia, and by its aptitude for the decolorization of malachite green agar. The conidia of *D. penicillatum* var. *sclerotiale* are uni- to quinqueseptate, the former measuring 10 to 22 by 3 to 7 (mean 14·4 by 5·5) μ and the latter 31 to 40 by 7 to 8 (35·3 by 7·6) μ. Moreover, unlike the imperfect states of *P. papaveracea* the new variety produces both in summer and winter conidiophores and conidia of the *D. penicillatum* type. The *Helminthosporium* state of *P. papaveracea* is present in the summer and is followed in winter exclusively by perithecia. According to Zogg (*Ber. schweiz. bot. Ges.*, 55, p. 240, 1945), the *Dendryphion* conidia are accompanied in the winter by perithecia, while in the summer the conidiophores and conidia approximate to those of *H. papaveris*. Pure cultures of the two states are indistinguishable.

The conidia of some of the 25 isolates of *H. papaveris* examined showed clear-cut morphological differences, which enabled them to be grouped into seven strains. For instance, two isolates were remarkable for their small dimensions, especially in the most prevalent bi- to quadriseptate forms (20·4 by 6·8 to 37·8 by 8·9 and 22·7 by 7·4 to 38·5 by 8·3 μ), and another two for their large size (33·9 by 9 to 43·4 by 9·4 and 30·5 by 8·7 to 48·5 by 9 μ). The individual conidial cells of another two acquired a circular shape through sharp constriction at the septa. The conidia germinated in three to four hours by means of one or more polar, bipolar, or median germ-tubes. An excellent medium for the growth of the conidial state is poppy decoction agar plus 2 per cent. glucose, on which the daily increment of the colonies ranges from 6 to 17 mm. as compared with 1 to 10 mm. on potato agar. In nutrient solutions the growth of the fungus is generally inhibited by the addition of physiologically acid salts (pH 5·6) and promoted by those of alkaline salts (pH 7·4 to 8·1). The best sources of carbon are lactose and glucose, and of nitrogen potassium nitrate, asparagine, and glycocol. The optimum pH for development on beer-wort agar is 7·4. Both *P. papaveracea* and *D. penicillatum* var. *sclerotiale* are capable of liquefying gelatin and disorganizing starch and pectin. The blight is perpetuated through the seed, sto which both mycelium and conidia adhere externally, while

the former is also present in the endosperm. *P. papaveracea* attacks all the organs and tissues of the plants; within the stems its growth is predominantly intracellular. Tracheomycosis was a feature of all the plants examined. The development of the pathogen, the course of the disease, and the incidence of infection are dependent on the prevailing weather conditions [ibid., 23, p. 120]. The existence of strongly and weakly pathogenic strains was revealed by inoculation experiments on seedlings, leaves, stems, flowers, and unripe capsules. In these tests *Papaver dubium*, *P. argemone*, and *P. rhoeas* proved to be resistant, and the examination of their seeds for spontaneous infection disclosed only 0, 3, and 1 per cent., respectively, compared with 19 per cent. in *P. setigerum*. *P. somniferum* var. *polycephalum* also showed only 3 per cent. and *P. caucasicum*, *P. nudicaule*, and *P. lateritium* were free from the fungus. The initial improvement in the stands of four varieties resultant on seed treatment with 0·1 per cent. liquid ceresan was not maintained during the growing season. The practice should be combined with sowing at the earliest practicable date.

Van Hoof (H. A.). **Cause and control of a leaf disease in Derris elliptica Benth.**—*Contr. gen. agric. Res. Sta., Bogor*, 115, 11 pp., 2 figs., 1950. [Indonesian summary.]

The unpublished results of investigations by J. Reitsma and Miss W. C. Slooff have shown that *Colletotrichum derridis* on *Derris elliptica* tendrils and leaves [*R.A.M.*, 30, p. 389] in Java is accompanied by a weakly pathogenic species of *Diplodia* and *Fusarium moniliforme* [*Gibberella fujikuroi*], the latter proving innocuous to sound tissues in inoculation experiments. Good control of the disease caused by *C. derridis* was obtained by three applications weekly of 1 per cent. Bordeaux mixture or 0·5 per cent. copper oxychloride as koperkalk Wieko [see above, p. 81], beginning as soon as the cuttings were planted. The beds should be planted approximately at the same time to prevent the spread of infection.

Rahman (S. M. A.). **Observation on the diseases of Tezpata.**—*Curr. Sci.*, 20, 5, p. 135, 1951.

Tezpata (*Cinnamomum tamala*), which produces a widely used aromatic ingredient and spice, suffers from two leaf spots, one caused by *Pestalotia cinnamomi* and the other by *Cercospora* sp., under shady and crowded conditions in East Bengal. The mature fructifications of *P. cinnamomi* emerge as black, pointed tips, visible macroscopically, on the leaf surface. The three medium cells of the fusiform, quadriseptate conidia, 27 by 8 μ, are golden-brown; the apical cell terminates in three stiff setae.

The spots formed by *C.* sp. are dark brown and zonate. The fungus is characterized by septate, undulate, thick-walled, dark brown conidiophores, and hyaline to faintly yellowish, tri- or rarely quadriseptate, elongate-fusiform conidia, 52 by 5·5 μ.

Kulkarni (Y. S.), Patel (M. K.), & Dhande (G. W.). **Xanthomonas cassiae, a new bacterial disease of Cassia tora L.**—*Curr. Sci.*, 20, 2, p. 47, 1951.

A bacterial disease was observed in September, 1948, on *Cassia tora* growing on the waste lands at Poona, Jalgaon, and Baroda, Bombay. The first symptoms on the leaves were circular, watersoaked spots, 1 mm. in diameter, surrounded by a well-defined halo. Within a fortnight they increased to 5 mm., with a dark brown to sooty black centre and a light brown margin. Shining beads or fine scales of exudate occurred on the lower surfaces of the lesions, which assumed an irregular shape on coalescence and a rugose aspect due to the drying of the exudate. Severely affected leaves turned yellow and fell. Under favourable temperature and humidity conditions the lateral and mid veins also contracted infection, which extended to the petioles and downwards to the stems, forming vertical streaks up to 2 in. in

length and causing a grey, later deep brown or black discoloration. An exudate was also produced on the stems, which at an advanced stage of infection developed fissures of varying extent. The pods bore numerous irregular, watersoaked spots all over the surfaces, including the edges, and were girdled at one or more points.

The causal organism, designated *Xanthomonas cassiae* n.sp., is a Gram-negative, capsulated, non-acid-fast rod, motile by a single polar flagellum, staining readily with common dyes, and measuring 1·2 to 2·1 by 0·8 to 1 μ. The colonies on potato dextrose agar are smooth, circular with lobate margins, shining, convex, pinard yellow (Ridgway), attaining a diameter of 1·2 cm. after seven days, striate only at the periphery. Milk is peptonized, litmus reduced, gelatin liquefied, and casein and starch digested; acid but no gas is evolved from dextrose, lactose, and sucrose; ammonia and hydrogen sulphide are produced; nitrates are not reduced; growth in synthetic asparagine medium is slight to fair and in Koser's citrate media fair; the optimum temperature is 27° C. and the thermal death point 51°. The pathogen is seed-borne.

Chona (B. L.) & Gattani (M. L.). **Kans grass (Saccharum spontaneum L.) a collateral host for Sugarcane smut in India.**—*Indian J. agric. Sci.*, 20, 3, pp. 359–362, 1 pl., 1950.

In experiments at the Indian Agricultural Research Institute, New Delhi, *Saccharum spontaneum* was shown to act as a collateral host of sugar-cane smut (*Ustilago scitaminea*) [see next abstract] and may prove a source of infection for cultivated varieties. Smutted *S. spontaneum* in the neighbourhood of cane fields should therefore be carefully rogued out.

Gattani (M. L.). **Induced variation in the germination of chlamydospores of Ustilago scitaminea.**—*Curr. Sci.*, 20, 5, p. 134, 1 fig., 1951.

Investigating the action of hydrophobic colloidal sulphur [*R.A.M.*, 29, p. 553] on the chlamydospores of *Ustilago scitaminea* [the agent of sugar-cane smut: ibid., 29, p. 354], at the Department of Agriculture, Bharatpur, India, the author observed that germination was inhibited on 1 per cent. water agar containing 20 p.p.m. of the fungicide. With 10 p.p.m colloidal sulphur 20 per cent of the spores presented 16 different types of abnormal germination after 24 hours at 23° C. The most interesting deviation, involving about 5 per cent. of the treated spores, consisted in the location of all four sporidia at the apex of the promycelium. In another 3 per cent. the sporidia were borne directly on the spore. The other aberrant modes of germination differed among themselves in the type of promycelia, the number of sporidia, and the formation of 'buckle' joints. These anomalies are almost certainly attributable to the action of the sulphur and not to genetic differences in spore constitution, since germination was uniformly normal in the control plates.

Chona (B. L.). **Studies on the diseases of Sugarcane in India. III. Sources and modes of red rot infection.**—*Indian J. agric. Sci.*, 20, 3, pp. 363-385, 2 pl., 1950.

In further studies of sugar-cane diseases in India [cf. *R.A.M.*, 30, p. 628] it was established that considerable infection by *Colletotrichum falcatum* [*Physalospora tucumanensis*: ibid., 30, pp. 601, 629] can take place in the north through infected soil, even when the planted setts are healthy [ibid., 21, p. 347]. Cane debris, spores, or mycelium may initiate infection. A healthy crop grown in a non-infested field from disease-free 'seed' may develop considerable infection through irrigation water containing fungus spores, disease incidence being much greater when infection takes place during July or August. In all cases the canes were infected through the nodes. Setts inoculated with the fungus or taken from diseased canes gave poor germination and heavy red rot infection in the resulting crop. Lesions often passed from mother setts to the new shoots. Insects are of

minor importance in initiating or spreading infection. Considerable natural infection may occur through the nodal regions [ibid., 30, p. 544], the young upper nodes being more susceptible than the older, basal ones. Canes may also be infected through the cut ends of the setts or through the natural growth cracks in the rind. Different varieties show a considerable difference in their resistance to red rot infection from the above sources. In soil, sett, and nodal infection experiments a pale, freely sporing isolate 78 consistently proved more virulent than a dark, sparsely sporing isolate 3. Isolate 29 gave an intermediate reaction. Some isolates are unable to infect the cane through the nodes, which accounts for the absence of red rot in some localities where inoculum is fairly abundant. Spores produced on leaf mid-rib lesions and on shoots of infected ratoon clumps constitute an important source of inoculum and means of dissemination.

Costa (A. S.) & Penteado (M. P.). **Corn seedlings as test plants for the Sugar-Cane mosaic virus.**—*Phytopathology*, 41, 8, pp. 758–763, 1 fig., 1951.

At the Agronomic Institute, Campinas, São Paulo, Brazil, maize seedlings of certain inbred lines and varieties, e.g., No. 419 of the Cateto variety, 2073–1–1–1 from Armour, and 718 and 754 from Cristal, were found to be eminently satisfactory as test plants for the sugar-cane mosaic virus [*R.A.M.*, 25, pp. 279, 419, 420; 30, p. 628]. Symptoms of the disease, usually reaching 100 per cent. on 8- to 12-day-old seedlings rubbed with infectious sap from P.O.J. 213 plus carborundum, may appear as soon as four days after inoculation as lines of chlorotic dots on the middle or base of an unfolding leaf. Maize plants grow better in pots than sorghum, mentioned by K. M. Smith as an indicator for the virus [ibid., 17, p. 52], and their leaves are better for mechanical inoculation. Uniform experimental results are ensured, moreover, by the use of homozygous inbred lines.

The virus from maize seedlings withstood ten minutes' heating at 55° C. and 24 hours' ageing at room temperature. Pathogenicity was substantially reduced by dilution at 10^{-3} (from 93·3 to 26·7 per cent. infection), but small percentages (6·6 and 3·3 respectively) were obtained even at 10^{-4} and 10^{-5}. The slight disparities between these data and those of Rafay in India [ibid., 30, p. 628] and Adsuar in Puerto Rico [ibid., 29, p. 478] are attributed to the greater susceptibility of maize than of sugar-cane or sorghum, used by them as indicators. Extract from recently infected maize plants was equally infective with that from field sugar-cane, if not more so. The use of maize inoculum is now a routine procedure in the sugar-cane breeding project at the above-mentioned Institute.

Various strains of the virus [loc. cit.] were identified by the reactions they induced on certain sugar-cane varieties. It is suggested that inoculation of highly susceptible maize lines and varieties might reveal divergences permitting their use as differential hosts.

Ramakrishnan (T. S.). **Two new rusts from South India.**—*Trans. Brit. mycol. Soc.*, 34, 2, pp. 141–145, 1 pl., 6 figs., 1951.

A new genus of rusts, *Gymnopuccinia*, is made to accommodate a new species recently found in south India, *G. pulneyensis* on *Toddalia asiatica*. The uredospores are stalked; the teleutospores, extruded in columns, are bicellular and embedded in a gelatinous matrix, the stalks also being gelatinous. *Phakopsora fici-elasticae* n.sp. on *Ficus elastica* is described. Both rusts were found in the Botany Gardens at Ootacamund.

Arx (J. A. v.). **Ueber die Gattung Laestadia und die Gnomoniaceen.** [On the genus *Laestadia* and the Gnomoniaceae.]—*Antonie van Leeuwenhoek J. Microbiol. Serol.*, 17, 4, pp. 259–272, 3 figs., 1951.

The genus *Gnomonina* was described by von Höhnel (*Ann. mycol., Berl.*, 16, pp.

35–174, 1918) to accommodate *Sphaeria alnea* Fr. on alder, the type of the genus *Laestadia* Auersw. (non Kunth), which was referred to the Gnomoniaceae on account of its apparently closed perithecia. However, at maturity the latter, immersed in the substratum, develop an apparently lateral beak which erupts to the exterior. The mature ascospores are bicellular. The fungus is thus a typical member of the genus *Plagiostoma* (syn. *Laestadia* and *Gnomonina*), and is named *P. alnea* (Fr.) n.comb. Other new combinations are *P. pustula* (Pers.) on oak leaves and *P. rehmii* (Sacc.) on hornbeam leaves.

A general description is given of the Gnomoniaceae, with a key to the 15 genera, the type species of which are discussed. *Gnomonia veneta* and *G. platani* on leaves of *Platanus* [*R.A.M.*, 19, p. 444] and beech, *G. quercina* on oak, and *G. tiliae* on lime (*Tilia*) [ibid., 15, p. 74] are regarded as synonymous and are united under the name *Apiognomonia errabunda* (Rob.) v. Höhn.

Webster (J.). **Graminicolous Pyrenomycetes. I. The conidial stage of Tubeufia helicomyces. II. The occurrence of the perfect stage of Helminthosporium teres in Britain. III. The occurrence of Microthyrium culmigenum on grasses in Britain.**—*Trans. Brit. mycol. Soc.*, 34, 3, pp. 304–308, 309–317, 318–321, 3 pl., 5 figs., 1951.

In the Department of Botany, University of Sheffield, pure culture work demonstrated that *Helicosporium phragmitis*, common on the stems and leaf sheaths of various cereals and grasses throughout the year, is the conidial state of *Tubeufia helicomyces*. During 1949 and 1950 a form of *Pleospora trichostoma* (syn. *Pyrenophora teres*) [cf. *R.A.M.*, 5, p. 417; 7, p. 89; 29, p. 123] was found on barley stubble in various localities in Yorkshire, Norfolk, and Nottinghamshire. Pure cultures from ascospores produced conidia referable to *Helminthosporium teres*, which when inoculated into Hunter's Plumage Archer, Hunter's Spratt Archer, and unnamed barley seedlings gave rise to net blotch symptoms [cf. ibid., 12, p. 163; 13, p. 316; 16, p. 443; 29, p. 353].

Microthyrium culmigenum [cf. ibid., 20, p. 427] is recorded for the first time in Britain, where it appears to be common on the stems and leaf sheaths of grasses, including *Arrhenatherum*, *Dactylis*, and *Holcus mollis*, and on oat stubble.

Sparrow (F. K.). **Podochytrium cornutum n.sp., the cause of an epidemic on the planktonic diatom Stephanodiscus.**—*Trans. Brit. mycol. Soc.*, 34, 2, pp. 170–173, 1 fig., 1951.

A description is given of a new species of Chytrid, *Podochytrium cornutum*, which caused a serious epidemic among populations of the planktonic diatom *Stephanodiscus niagarae* in Lake Mendota, Wisconsin, in January, 1950.

Shaw (C. D.) & Yerkes (W. D.). **The downy mildews (Peronosporaceae) of the Pacific Northwest.**—*Northw. Sci., Wash.*, 25, 2, pp. 76–82, 1951.

This is a list of 51 species of Peronosporaceae [*R.A.M.*, 29, p. 385] occurring on 143 hosts in the Pacific Northwest (comprising Washington, Oregon, Idaho, Montana, British Columbia, Alberta, and Alaska), based on material preserved in the Mycological Herbarium at the State College of Washington and the authors' personal collections. *Peronospora tabacina* [C.M.I. map No. 23] is recorded on tobacco in Washington.

Kausche (G.-A.) & Lwowski (W.). **Elektro-optische Untersuchungen zum Problem der Aggregationszustände von Tabakmosaikvirus-Protein in Lösung.** [Electro-optical studies on the problem of the aggregation states of Tobacco mosaic virus protein in solution.]—*Z. Naturforsch.*, 6b, 2, pp. 60–63, 6 graphs, 1951.

Previous studies on the problem of the aggregation or polymerisation of the tobacco mosaic virus protein in solution are reviewed [cf. *R.A.M.*, 29, pp. 177,

539; 30, p. 346, *et passim*]. In the writers' electro-optical investigations at the Virus Research Institute, Heidelberg, Germany, the average particle lengths of three preparations in this state were as follows: 'normal' tobacco mosaic virus from greenhouse Samsun tobacco plants 390 mμ; TM44, a mutant of the foregoing produced by X-ray irradiation [ibid., 19, p. 437], 475 mμ; and TM88, another mutant arising from irradiation with 10 mg. mesothorium in a lead chamber, 300 mμ.

Meneghini (M.) & Delwiche (C. C.). **The multiplication of Tobacco mosaic virus in the host Tobacco plant.**—*J. biol. Chem.*, 189, 1, pp. 177–186, 1 graph, 1951.

In investigations at the University of California, Berkeley, on the multiplication of tobacco mosaic virus in tobacco, leaves from tobacco plants were infiltrated with solutions of N^{15} as a tracer element in the form of $N^{15}H_4Cl$ and samples taken at intervals. The initial results indicate that the virus is formed in the host from one or more nitrogenous compounds, such as amino acids, which undergo a more rapid exchange of nitrogen with the ammonium ion than does the extractable protein of the cell. It is further concluded that, at any rate after infection has run its course in the plant, the virus behaves as a foreign protein which is not in dynamic equilibrium with the other cell constituents. Evidence is adduced which strongly supports the view that the process of virus formation in the host is a virtually irreversible one.

Stahmann (M. A.), Graf (L. H.), Patterson (E. L.), Walker (J. C.), & Watson (D. W.). **The inhibition of Tobacco mosaic virus by synthetic lysine polypeptides.**—*J. biol. Chem.*, 189, 1, pp. 45–52, 1951.

The reversible inhibition of the infectivity of tobacco mosaic virus [cf. *R.A.M.*, 30, p. 447], judged by the number of lesions obtained in inoculation tests on *Nicotiana glutinosa* × tobacco hybrids, by carbobenzoxylysine polypeptides of high molecular weight is reported from the Wisconsin Agricultural Experiment Station. The effects of these compounds are closely analogous to those induced by virus-inhibitory proteins [ibid., 27, pp. 58, 508].

Gigante (R.). **Malattie infettive delle piantine di Tabacco nei semenzai del Leccese.** [Infectious diseases of Tobacco seedlings in the seed-beds of Lecce.]—*Tabacco*, 55, 622, pp. 147–163, 11 figs., 1951.

During 1950 tobacco seedlings in seed-beds in the province of Lecce, Italy, were affected by wildfire (*Pseudomonas tabacum*) [*R.A.M.*, 30, pp. 83, 249] and ring spot virus [loc. cit.]. Against the former, prevention is by seed-bed hygiene and seed treatment [cf. ibid., 15, pp. 179, 687; 28, p. 424], and control by spraying [cf. ibid., 29, p. 292] and by soil disinfection with 2 per cent. formalin solution or 10 per cent. iron sulphate solution. In wet seasons it is advisable to spray with Bordeaux (0·5 to 1 per cent.) even in the absence of the disease, starting about five weeks before transplanting and repeating at intervals of seven to ten days; this treatment has kept many local beds free from the disease.

The control of ring spot virus [cf. ibid., 9, pp. 348, 615; 12, p. 472] depends largely on prevention by seed-bed hygiene. Only seed from healthy plants should be used. Tobacco plantings should be remote from other solanaceous plants, cucurbits, and legumes.

Vidali (A.) & Ciferri (R.). **Esperienze di lotta contro l'oidio del Tabacco (Erysiphe cichoracearum) a mezzo di tiosolfato e sali di litio.** [Experiments on the control of Tobacco *Oidium* (*Erysiphe cichoracearum*) by means of thiosulphate and lithium salts.]—*Notiz. Mal. Piante, 1951*, 14, pp. 33–44, 1951. [English summary p. 102.]

This information has already been noticed from another source [*R.A.M.*, 30, p. 633].

Zycha (H.). **Das Rindensterben der Buche.** [Bark necrosis of the Beech.]—*Phytopath. Z.*, 17, 4, pp. 444–461, 11 figs., 1951.

From his extensive studies on the cortical necrosis of beeches [*R.A.M.*, 29, p. 542], which has caused appreciable damage in Germany, mostly on trees of 80 years old and over, for the last ten years or so, the author concludes that extremes of weather, such as prevailed during the rigorous winter of 1939 to 1940 and the abnormally dry summer of 1947, are the primary etiological factors. Secondary invasion of the damaged areas by fungi, especially *Nectria coccinea* [ibid., 24, p. 212] and insects culminates in the collapse of the bark. No significance is attached to the presence on the diseased trees of wood-destroying fungi, such as *Polyporus* [*Fomes*] *fomentarius* and *P. adustus* [ibid., 29, p. 483], which are equally common on those unaffected by the necrosis.

Vanterpool (T. C.) & Macrae (Ruth). **Notes on the Canadian Tuckahoe, its occurrence in Canada and the interfertility of its perfect stage, Polyporus tuberaster Jacq. ex Fries.**—*Canad. J. Bot.* (formerly *Canad. J. Res.*, Sect. C.), 29, 2, pp. 147–157, 2 pls., 4 diags., 1951.

The Canadian 'tuckahoe', the sclerotium of *Polyporus tuberaster*, commonly found in the parkland belt of the Canadian prairies, where land supporting virgin poplar groves (mainly *Populus tremuloides*) is being brought under cultivation, was demonstrated by interfertility studies with single-spore isolates from sporophores from four sources in western Canada and one in Italy to be the same as the European species.

Ciferri (R.). **Nomenclatura del fungo che causa la 'defogliazione primaverile' dei Pioppi.** [The nomenclature of the fungus causing 'spring defoliation' of Poplars.]—*Notiz. Mal. Piante, 1951*, 14, p. 88, 1951. [English summary, p. 103.]

The fungus causing 'spring defoliation' of poplars in Italy [*R.A.M.*, 30, p. 637] is renamed *Endostigme populina* n.comb. (syn. *Didymosphaeria populina* and *Venturia populina*) [ibid., 19, p. 387; 30, p. 202]. *Stigmina populi* and *Septogloeum rhopaloideum* should probably be added to the synonyms of the conidial state.

Kotte (W.). **Über das Vorkommen der durch Pseudomonas juglandis Pierce verursachten Walnusskrankheit in Deutschland.** [On the occurrence of the Walnut disease caused by *Pseudomonas juglandis* Pierce in Germany.]—*Phytopath. Z.*, 17, 4, pp. 347–352, 5 figs., 1951.

There have been few records to date of the occurrence of walnut bacterial blight (*Pseudomonas* [*Xanthomonas*] *juglandis*) [C.M.I. map No. 133] in Germany. It was reported by Appel in 1929 and by Schneiders (Der neuzeitliche Walnussbau) in 1941, and since 1938 has been observed in Baden, causing substantial damage in seasons marked by heavy precipitation during and following flowering. Spraying with Bordeaux mixture as practised in the United States [*R.A.M.*, 25, p. 372; 30, p. 252] is recommended.

Leaf cast of Larch, Meria laricis.—*Leafl. For. Comm., Lond.*, 21 (revised), 4 pp., 3 figs., 1951. 3*d*.

This is a brief, popular account of the symptoms and control of larch leaf cast (*Meria laricis*) [*R.A.M.*, 13, p. 282; 15, p. 761]. Probably the best control method is to grow all European larch in nurseries which are able to produce one-year seedlings big enough to line out, and transplants large enough to plant after one year in the transplant lines. In this way the young trees will not spend two years in the same place and will escape the heavy infection in the second year which

results from the proximity of the fallen spore-bearing needles. New nurseries and those at present unaffected are more likely to remain free from infection if no imported stock is introduced.

ROBAK (H.). **Noen iakttakelser til belysning av forholdet mellom klimatiske skader og soppangrep på nåletrær.** [Some observations to elucidate the connexion between climatic injuries and fungal infection of conifers.]—*Medd. Vestl. forstl. Forsøkssta.* 27 (8, 2), 43 pp., 5 figs., 1 diag., 1 map, 1951. [English summary.]

Of recent years *Nectria cucurbitula* [*R.A.M.*, 27, p. 267] has been consistently associated (mostly in its conidial state of *Cylindrocarpon cylindroides* var. *tenue*) with a die-back of the young branches and tops of *Abies alba*, *A. balsamea*, *A. concolor*, *A. nobilis*, and *A. nordmanniana* at two localities in the vicinity of Bergen, Norway. Perithecia were detected only occasionally and then on organs dead for at least two years. The occurrence of 'frost rings' of parenchyma cells in the parts of the damaged branches adjacent to the dead tissue is attributed to physiological disturbances induced by the fungal infection, which make the organs more sensitive to light frosts. The available evidence is against the assumption that frost is the primary cause of death.

About 1930 pine (*Pinus sylvestris*) stands in a State plantation in Rogaland established between 1902 and 1904 began to suffer from a lethal attack by *Polyporus* [*Fomes*] *annosus* [ibid., 25, p. 193], which led to extensive deterioration within the next few years. In the spring of 1939 three-year-old spruce (*Picea abies*), *Pseudotsuga taxifolia*, and *A. grandis* were planted on the slopes from which the diseased pines had been cleared, while two-year-old Japanese larches (*Larix leptolepis*) were placed some distance away. Inspections in 1942, 1945, and 1949 revealed considerable resistance to *F. annosus* in the larch plantings, a high degree of susceptibility in *P. taxifolia*, and an intermediate reaction in spruce. There was a general parallelism between the damage resultant on adverse climatic factors and the severity of infection by *F. annosus*.

PINTO-LOPES (J.). **Poliporoses e fungos da decomposição da madeira em Portugal.** [Polyporoses and fungi causing decomposition of wood in Portugal.]—*Rev. Fac. Ciênc. Lisb.*, Sér. 2, C, 1, pp. 53–108, 40 figs., 1950. [English and German summaries.]

Some of the information presented in this survey of the damage caused by wood-rotting fungi in Portugal has already been noticed from another source [*R.A.M.*, 30, p. 85]. New records for the country are *Fomes annosus* on tree stumps and mine timber and *Trametes squalens* and *Xanthocrous* [*Polyporus*] *circinatus* [ibid., 29, p. 392] on pine stumps. *P. sulphureus* [ibid., 29, pp. 3, 392] and *Lenzites* [*Daedalia*] *quercina* are common on *Eucalyptus* stumps. Among the many trees, besides *Eucalyptus*, attacked by *Phellinus* [*F.*] *torulosus* are oaks, which are also hosts of *Phellinus* [*F.*] *salicinus* f. *densus* and *P.* [*F.*] *robustus* [ibid., 29, p. 238, 339]. Cork oak (*Quercus suber*) suffers principally from a fibrous rot caused by *X.* [*Polyporus*] *cuticularis*. The many hosts of *X.* [*P.*] *hispidus* [ibid., 30, p. 85] include poplar, apple, *Sophora japonica*, and plane [*Platanus*]. *X.* [*F.*] *tamaricis* is common on tamarisk (*Tamarix anglica*) near the sea. Olives develop a brown pocket rot due to infection by *F. torulosus*.

The two most destructive species on railway sleepers are *L. trabea* [ibid., 29, pp. 1, 2, 3, 592] and *T. hispida* [*T. trogii*], the former causing a brownish-yellow and the latter a white rot, both fibrous. Other fungi concerned in the decay of this class of timber are *Coriolus* [*Polystictus*] *versicolor*, *Leucoporus* [*Polyporus*] *arcularius* [ibid., 9, p. 75], *Stereum hirsutum*, *Auricularia* [*mesenterica* var.] *lobata*, *Paxillus*

panuoides [ibid., 27, p. 206; 29, pp. 547, 593, *et passim*], and *Schizophyllum commune* [ibid., 28, p. 607]. *L. trabea* also caused extensive damage on quays.

Merulius lacrymans is the most common fungus in buildings, which may, however, also contain *P. panuoides*, *Poria xantha* [ibid., 28, pp. 200, 367, 369], and *Leptoporus* [*Polyporus*] *destructor* [ibid., 17, p. 715].

Portugal harbours certain Polyporaceae which are absent from other European countries, e.g., *Ungulina ochroleuca* [*P. ochroleucus*] on *Arbutus unedo* and *Erica arborea*. *X.* [*F.*] *ribis* f. *ulicis*, hitherto reported from only one locality in France, is fairly common on gorse in Portugal.

SUOLAHTI (O.). **Über eine das Wachstum von Fäulnispilzen beschleunigende chemische Fernwirkung von Holz.** [On a remote chemical action of wood accelerating the growth of rotting fungi.]—*Publ. tech. ForschAnst. Finnl.* 21, 95 pp., 22 figs., 1 diag., 1 graph, 1951. [English summary.]

The addition to Kolle flask cultures of lignicolous fungi at the Technical Research Institute, Helsinki, Finland, of small blocks of wood, insulated from the medium and mycelium in preliminary experiments by a support a few millimetres high and in the main tests suspended above it, resulted in a marked and constant impetus to mycelial growth. As no reference to such a phenomenon could be found, further studies were accordingly carried out.

The fungus used in the majority of the tests was probably a strain of *Stereum sanguinolentum* isolated from wood pulp [*R.A.M.*, 29, p. 325]. Other species stimulated to a greater or lesser extent included *Coniophora cerebella* [*C. puteana*], *Fomes annosus*, *F. fomentarius*, *F. igniarius*, *F. ungulatus*, *Ganoderma applanatum*, *Lentinus lepideus*, *Pholiota mutabilis*, *Pleurotus ostreatus*, *P. ulmarius*, *Polyporus destructor*, *P. schweinitzii*, *Polystictus versicolor*, *Poria vaporaria*, *Trametes cervinus*, *T. cinnabarina*, *T.* [*F.*] *pini*, *T. serialis*, *Aspergillus niger*, *Monotospora daleae*, *Trichoderma lignorum* [*T. viride*], *Pullularia pullulans*, and *Hormodendrum*, *Lecythophora*, and *Cladosporium* spp.

Pine and birch sapwood were used in the main series of trials, but some supplementary experiments were performed to determine the influence of a number of other woods on *S. sanguinolentum*. Oak, ash, and elm proved to be definitely weaker in their action than pine, spruce, birch, aspen, alder, goat willow [*Salix caprea*], mountain ash [*Sorbus aucuparia*], lime [*Tilia*], and maple [*Acer*]. The growth-promoting principle was confined to dried green wood or wood re-moistened after drying. It originates in the course of drying through an oxidation process, which is materially expedited by the maintenance of a temperature ranging from 110° to 130° C. and the application of iron salts, especially ferric sulphate, to the wood. Ether extract of wood remained inactive until it was heated, together with the extracted wood, for 18 hours at 100°. The hypothesis that fatty acids formed the basis of the operative factor was verified by the fact that certain unsaturated acids, e.g., oleic and linoleic, acted in the same way after heating. The activating substance in the wood appeared to be very volatile. The result of numerous analytical tests indicated its probable status as a saturated, neutral, saponifiable material.

GÄUMANN (E.). **Einige Erfahrungen mit boucherisierten Leitungsmasten.** [Some results with Boucherized transmission poles.]—Reprinted from *Schweiz. Z. Forstw., 1950*, 9, 18 pp., 1 fig., 1950. [French summary.]

The author's previous contribution to the subject of the preservation of transmission poles by the Boucherie process [*R.A.M.*, 27, p. 303] in Switzerland appeared in *Schweiz. Z. Forstw.*, 86, pp. 1 *et seq.*, 1935.

The average service life of the 60,000 poles requiring replacement by the Postal and Telegraph Administration from 1940 to 1948 was 22·5 years. The sole agent

of destruction was *Polyporus vaporarius* [*Poria vaporaria*], which grows rapidly (16 mm. daily) under favourable conditions of humidity and temperature (optimum 21° to 30° C.) and is very tolerant of copper, withstanding for instance 10 per cent. copper sulphate. The Boucherie method is effective against all the other fungi (nearly 70 species) attacking pole timber, and its recent failure, after almost a century of use, to control *P. vaporaria* is attributed to the development, either by habituation to the toxin or through mutation under its influence, of immune strains of the pathogen.

Infection may originate in the soil, but little is known regarding this matter. The fungus can persist for at least 10 and possibly more than 30 years on rotten fragments of wood in the soil. Once it has gained a foothold in a pole, spread is effected chiefly by means of implements, such as climbing irons and borers, which should be cleansed with a brush on passing from one pole to another. The efficacy of copper sulphate injections may be enhanced by overnight impregnation of the butt to a depth of 2 m. with coal tar oil or pentachlorophenol at a temperature of 90° to 100°; sterilization of the soil in the socket by chemical treatment or heat; and a supplementary treatment of the poles by superficial flaming, injection of an antiseptic through punctures, or the application of a protective bandage steeped in a fungicide. None of these measures, however, can do more than retard the disorganization of the pole. The possibility of a substitute for copper sulphate is considered and dismissed as impracticable on various grounds.

Schulz (G.). **Ein mykologisches Verfahren zur Bewertung vorbeugender Schutzmittel gegen das Verblauen von Kiefernholz.** [A mycological procedure for the evaluation of prophylactic preservatives against the blueing of Pine wood.]—Reprinted from *Angew. Bot.*, 26, 1, 13 pp., 4 figs., 1951.

At the Institute of Applied Mycology and Wood Preservation, Hann. Münden, Germany, a method has been devised of testing the toxicity of chemical preparations to fungi causing blue stain of pine wood. In brief, the test blocks or disks, after a preliminary drying at 105° C., are pressure-impregnated for five minutes in each of the chemicals at an appropriate range of concentrations prior to inoculation with 1 ml. of a conidial suspension of the pathogens, represented in these experiments by *Scopularia phycomyces*, *Pullularia pullulans*, *Ophiostoma* [or *Ceratostomella*] *pini*, *Trichosporium tingens* [*R.A.M.*, 14, p. 273] (all supplied by Dr. E. Rennerfelt of Stockholm), and an unnamed blueing fungus strain 253. After about a month the extent of the resultant blueing is assessed and the 'mycocidal threshold value' determined for each fungicide in comparison with sodium pentachlorophenol.

Hägglund (E.) & Lange (P. W.). **Über den Sulfitaufschluss von weissfaulem Buchenholz.** [On the sulphite treatment of white-rotted Beech wood.]—*Makromol. Chem.*, 6, pp. 280–291, 10 figs., 1951. [English summary.]

At the Swedish Wood Research Institute, Stockholm, sulphite treatments were carried out on beech wood attacked by *Polyporus* [*Fomes*] *igniarius* [*R.A.M.*, 28, p. 552]. The cell wall bounding the lumen was found to be coated with a substance absorbing ultra-violet light, possibly a tannin, which accumulated during boiling until the lumen was filled and the normal circulation of the liquor largely precluded. The irregular decomposition of the wood thus induced leads to a more extensive degradation of the cellulose in the fibres than occurs under normal conditions, with consequent deterioration in the quality of both paper and rayon pulp.

Narayanamurti (D.). **Note on treated wooden transmission poles in India.**—*For. Bull. Dehra Dun*, N.S., 140, 42 pp., 14 pl., 1 diag., 1948. [Received November, 1951.]

This bulletin treats of the selection, treatment, and care of wooden transmission poles in India [cf. *R.A.M.*, 22, p. 5; 30, p. 397], the type of wood to use, the pro-

perties of the different species, causes of deterioration, the preparation of preservatives, and the prolongation of the life of partly decayed poles. Among the tables given, one lists the Indian species tentatively suggested for use, giving their trade and botanical names, the parts of India, Burma, and the Andaman Islands where they are available, physical details, durability (in five categories), and treatability of the heartwood (five categories). Of the comprehensive tables (pp. 27–42) number V summarizes the available data from various parts of the world on the treatment and service life of wooden poles, together with the obtained or estimated results and causes of replacement. Table VI summarizes similar data on wooden transmission poles in India and shows that at the Forest Research Institute, Dehra Dun, *Pinus longifolia* poles treated with 6 per cent. ascu [ibid., 27, p. 52] by the Lowry process at 15 lb. per cu. ft. or with 40:60 creosote plus earth oil (Lowry 10 lb.) and installed in October, 1937, were still sound in October, 1947, as were *Shorea robusta* poles treated with 6 per cent. ascu or 50:50 creosote plus earth oil (both Lowry and open tank, 3·8 to 5·4 and 5·3 to 8·1 lb.) and installed in December, 1938, though treatment with 4 per cent. Wolman salt (Lowry 6·5 to 9) of similar poles installed in February, 1942, allowed fungal attack at ground level by October, 1947. *Terminalia tomentosa* poles treated with 6 per cent. ascu (Lowry 5·5 to 7·9) and installed in December, 1938, were still sound in October, 1947. Pieces of *Bruguiera* spp. treated with 2 per cent. ascu (full cell and Lowry, 5·6 to 8·4) or 50:50 creosote plus earth oil (open tank 7·2 to 7·7) and installed in March, 1942, all remained sound until 1947. Teak poles (50:50 creosote plus earth oil, full cell 1·5 to 4·1, Lowry 1·4 to 3·3, open tank 2·5 to 4·5) installed in March, 1943, were still sound in October, 1947, except one, which showed slight termite attack. Installed in February and March, 1942, pieces of *Chukrasia tabularis* (open tank 2·9 to 4·6), *T. myriocarpa* (open tank 11·1 to 14·9 and Lowry 5·2), *Cinnamomum cecidodaphne* (open tank 10·2 to 13·3), and *Duabanga sonneratioides* (Rueping 7, Lowry 18·4 to 20·2, open tank 19·1 to 19·6) were still sound in October, 1947.

No exhaustive survey of the fungi causing damage to poles in India has yet been made, but fungi found on *S. robusta* poles included *Fomes lividus* [cf. ibid., 6, p. 17], *Polystictus steinheilianus* [ibid., 25, p. 21], *Lentinus subnudus*, *F. lignosus* [ibid., 21, p. 399], *Trametes cubensis*, *Stereum hirsutum* [loc. cit.], and *Polyporus ostreiformis* [cf. ibid., 22, p. 454], while those on *Pinus longifolia* included *T. cubensis* and *Lenzites striata* [cf. ibid., 3, p. 692; 7, p. 687; 11, p. 218].

Barbier (G.), Trocmé (S.), & Chabannes (J.). **Carence en manganèse de cultures irriguées à l'eau d'égout : ses causes.** [Manganese deficiency in crops irrigated with sewage water: its causes.]—*C.R. Acad. Sci., Paris*, 230, 5, pp. 465–467, 1950.

Vegetables grown on the sandy soils of Paris sewage farms suffer from an interveinal chlorosis caused by manganese deficiency, which is completely and rapidly curable in spinach (*C.R. Acad. Agric. Fr.*, 34, p. 910, 1948), peas, beans [*Phaseolus vulgaris*], leeks, and potatoes by spraying the foliage with a 0·2 per cent. solution of manganese sulphate [*R.A.M.*, 29, p. 476]. There are at least two contributory causes: the soil is low in manganese, though solubility may be promoted by the reducing action of organic substances in the sewage; and the stable humic residues accumulated on the surface of the mineral particles largely prevent the action of reducing or dissolving agents.

Pound (G. S.), Cheo (P. C.), Calvert (O. H.), & Raabe (R. D.). **Extent of transmission of certain Cabbage pathogens by seed grown in Western Washington.**—*Phytopathology*, 41, 9, pp. 820–828, 2 figs., 1951.

Cabbage seed lots grown in the Puget Sound area of Western Washington from 1946 to 1950, inclusive, were assayed to determine the extent of transmission of

black rot (*Xanthomonas campestris*) [*R.A.M.*, 29, p. 393], black leg (*Phoma lingam*) [ibid., 27, p. 343], ring spot (*Mycosphaerella brassicicola*) [ibid., 29, p. 341], and black leaf spot (*Alternaria brassicicola*) [ibid., 29, p. 87]. Seeds of the 1946 harvest yielded both eastern-type virulent strains and the mildly pathogenic Puget Sound strain of *P. lingam* [ibid., 29, p. 282]. The 1947 to 1949 samples harboured only the Puget Sound strain, while those of 1950 were free from all forms of *P. lingam*. The virulent infection of 1946 may have resulted from the introduction of inoculum on untreated stock seed sent from the east to Puget Sound for increase, followed by seed pod infection during the abnormally wet June of that year. Neither *X. campestris* nor *M. brassicicola* was isolated from any of the samples, but *A. brassicicola* was a regular occupant, being particularly prevalent in 1947 and 1948, while *Sclerotinia sclerotiorum* [ibid., 29, p. 341] was detected occasionally.

BAIN (D. C.). **Observations on resistance to black rot in Cabbage.**—*Plant Dis. Reptr*, 35, 4, pp. 200–204, 1951. [Multilithed.]

In resistance tests at the Truck Crops Branch Station, Crystal Springs, Mississippi, instead of spraying cabbage plants with inoculum of *Xanthomonas campestris* [*R.A.M.*, 30, p. 453] seeds were soaked in a liquid culture [see preceding abstract]. When germination was evident, the filter paper with the seed was placed on fumigated soil in pots and then covered with a standard amount of soil. Symptoms of *X. campestris* were obvious on the cotyledons of some susceptible varieties eight to ten days later. By this method the use of a large number of plants in a minimum of space (roughly 550 plants per 4-in. pot) was possible. Plants were subjected to infection at the very earliest stage of development and each to comparable amounts of inoculum, thus saving much time and the trouble of arranging suitable conditions for the incubation period. Six varieties of cabbage, Premium Late Flat Dutch, Succession, Red Acre, Marion Market, Wisconsin Ballhead, and Early Round Dutch, were all noted as resistant in three or more tests, although seed of these same varieties from other sources gave susceptible plants. There was a definite correlation between the disease ratings and the time of germination. Between 300 and 400 apparently healthy plants of different varieties of cabbage have been selected out of some 350,000 plants from inoculated seed. Of the estimated 2,500 cauliflower seeds tested thus far, only one plant apparently free of black rot has been obtained.

WIEBOSCH (W. A.), VAN KOOT (Y.), & VAN 'T SANT (L. E.). **Hartloosheid en klemhart bij Bloemkool.** [Blindness and whiptail in Cauliflower.]—*Meded. Inst. plziektenk. Onderz., Wageningen*, 13, 55 pp., 25 figs., 2 graphs, 1950. [English summary.]

Besides common blindness, caused principally by low winter temperatures, cauliflowers in Holland are affected by molybdenum deficiency (whiptail) [*R.A.M.*, 31, p. 2], associated with foliar malformation and the development in the heart of small, swollen, leaf primordia, bending over the growing point, which sometimes die, shrivel, or leave a rotten mass. The heart also often contains a rudimentary head. While common blindness is irremediable, plants suffering from molybdenum deficiency (mostly January-sown Alpha) frequently recover. The whiptail condition is promoted by low temperatures in the seed-bed and shortly after transplanting, a dry spell, especially just after transplanting, and the excessive use of nitrogenous amendments at the same stages. All cultural measures should be directed towards the maintenance of even growth, any interruption in which favours these anomalies. Excellent control of molybdenum deficiency was obtained in two tests at Naaldwijk in 1949 to 1950 by spraying with 0·01 to 0·1 per cent. ammonium molybdate [ibid., 28, p. 369].